March 5, 1945

STEEL

The Magazine of Metalworking and Metalproducing

ESTABLISHED 1882

TECHNOLOGY DEPT.

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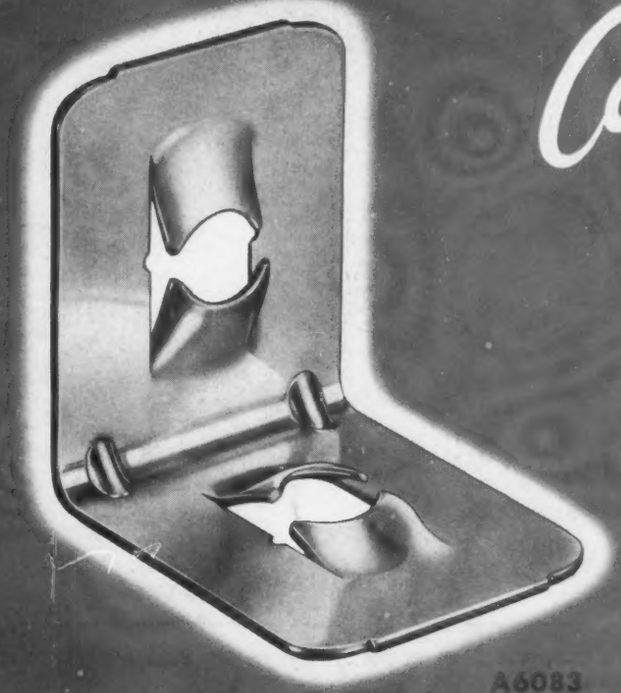
MAR 5 1945
DETROIT

SPEED NUT and ANGLE BRACKET *Combined* INTO ONE!



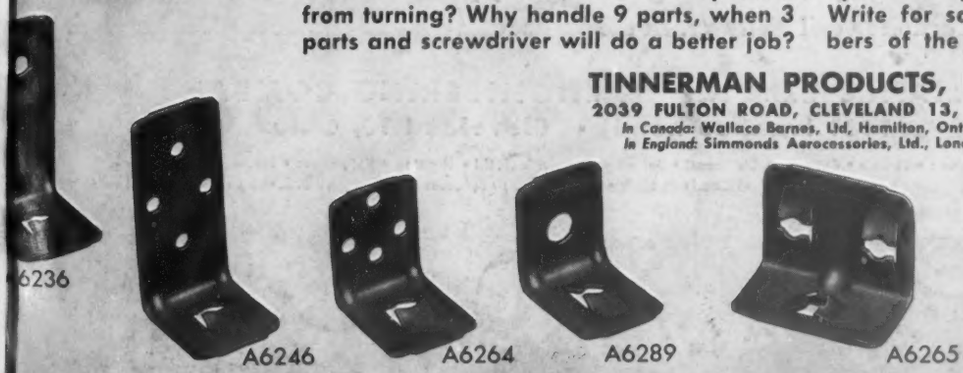
A6083

ANGLE BRACKET SPEED NUTS

Why not use brackets with self-locking nuts *built right in them?* Why fumble around with separate lock washers and threaded nuts and use a wrench besides to keep them from turning? Why handle 9 parts, when 3 parts and screwdriver will do a better job?

These SPEED NUTS lock with a firm spring tension that permanently prevents vibration loosening. They reduce weight, speed up assembly, and strengthen the structure. Write for samples, mentioning part numbers of the types that interest you most.

TINNERMAN PRODUCTS, INC.
2039 FULTON ROAD, CLEVELAND 13, OHIO
In Canada: Wallace Barnes, Ltd, Hamilton, Ontario
In England: Simmonds Aerocessories, Ltd., London



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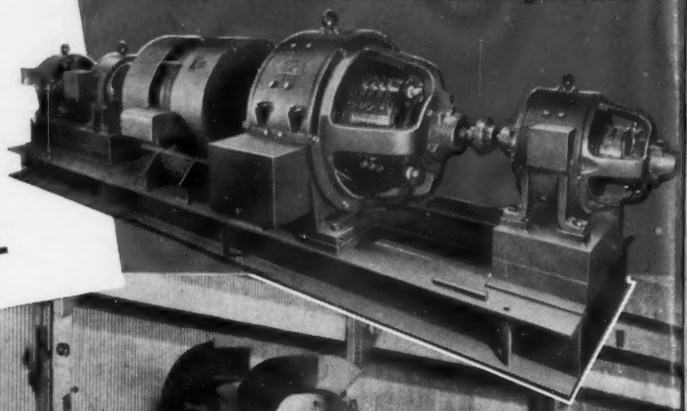
Speed Nuts
PATENTED
* Trade Mark Reg. U. S. Pat. Off.
FASTEST THING IN FASTENINGS

THE BASIC PRINCIPLE
of Spring-Tension Lock is
Embodied in all Speed Nut Designs

R v.116² My-Ap1945

OPERATIONS SIMPLIFIED IN TWO-HIGH SKIN PASS MILL



System operates from the plant A-c circuit, through variable-voltage power from a Reliance 5-unit M-G set with booster-generators.

Constantly controlled tension under all conditions, vital to satisfactory results in handling coiled steel, is obtained automatically in this mill by means of Reliance Motor-drive with all-electric, centralized control.

The uncoiler is kept under proper tension during all speed changes, and during the progressing reduction in coil diameter. At the same time, delivery tension is maintained as the coil increases on the recoiler.

In ease and simplicity of operation, improved quality as well as quantity of production, this application of Reliance Motor-drive has more than paid its way in comparison to former methods. If you would like to investigate the many possibilities of all-electric control, why not talk with a Reliance application engineer?

RELIANCE ELECTRIC & ENGINEERING COMPANY

1081 Ivanhoe Road • Cleveland 10, Ohio

Birmingham • Boston • Buffalo • Chicago • Cincinnati • Detroit • Greenville (S. C.) • Houston • Kalamazoo • Los Angeles • Minneapolis New York • Philadelphia • Pittsburgh • Portland (Ore.) • St. Louis • San Francisco • Syracuse • Washington, D. C. • and other principal cities

TECHNOLOGY

M J.E.

RELIANCE A-C D-C MOTORS

"Motor-Drive is More Than Power"

Why Sheet Steel?

Why sheet steel for your postwar product, or contract job?

Because it's not only the cheapest, most easily-worked material—it's also the one that's naturally adapted to the widest range of applications. Sheet steel is ductile in its flat state—flexible, in the lighter gages—but as soon as it is ribbed, or formed in a "cell" of compound curvature, it becomes stronger and stiffer than can any other material of equal weight and volume.

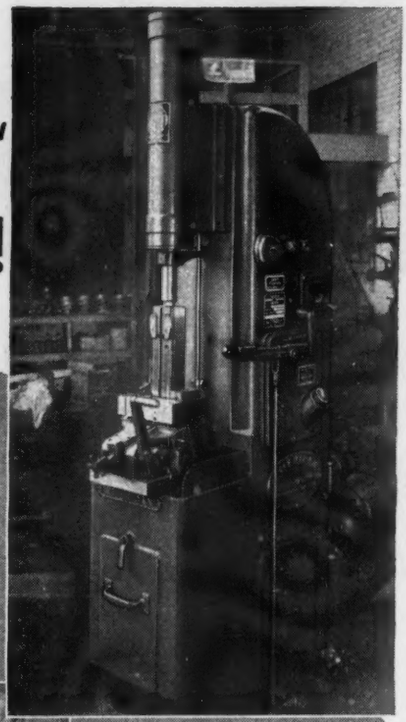
Consider it this way: Isn't the "cellular" sheet steel object—be it a refrigerator or a hub cap or an automobile fender—just about as efficient a combination of design and material as you can imagine?

Let sheet steel be your postwar material, and choose your sheets from Bethlehem's complete line. We make sheets for all purposes—deep-drawing, cold forming, stamping and welding; galvanized sheets; Beth-Cu-Loy (copper-bearing) for extra corrosion-resistance; and many others. Let us help you determine what kind of sheet can best serve your purpose. Get in touch with our nearest district office, or write to Bethlehem Steel Company, Bethlehem, Penna.

BETHLEHEM STEEL

Put this

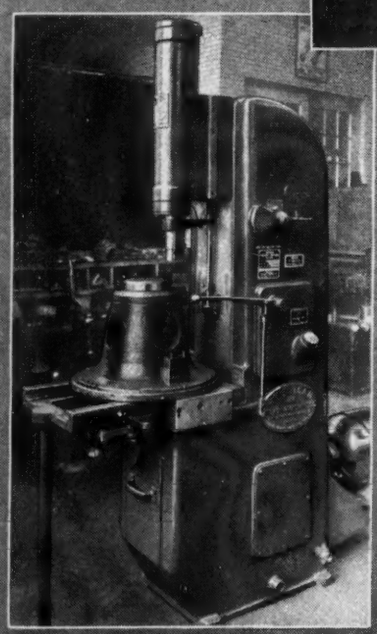
"JACK-OF-ALL-TRADES" on your production line!



Standard American Hydraulic Press does many types of jobs!

A standard machine capable of performing a variety of different operations is the V-1-½ 4-ton *American* Hydraulic Press. It can handle innumerable tooling adaptations for use on a wide variety of parts. Reconversion is no problem with versatile equipment of this kind.

Let *American* engineers show you how standard *American* equipment can serve you in war production today, yet be easily converted to perform your peacetime manufacturing operations. There is no obligation. Write today for further details.



The flexibility of the standard V-1-½ machine is graphically illustrated in the accompanying photographs. The upper picture shows the set-up for broaching a dovetail slot in rifle sights. High rate of production is maintained with ease of handling. The illustration at left shows the *same machine* tooled for assembling studs in an aircraft gear housing. This set-up features automatic indexing and locating of the part for pressing home the studs.

Protect your broaching tools when not in use. Tools last longer and give more satisfactory service if this precaution is taken.

MEMBER BROACHING TOOL INSTITUTE

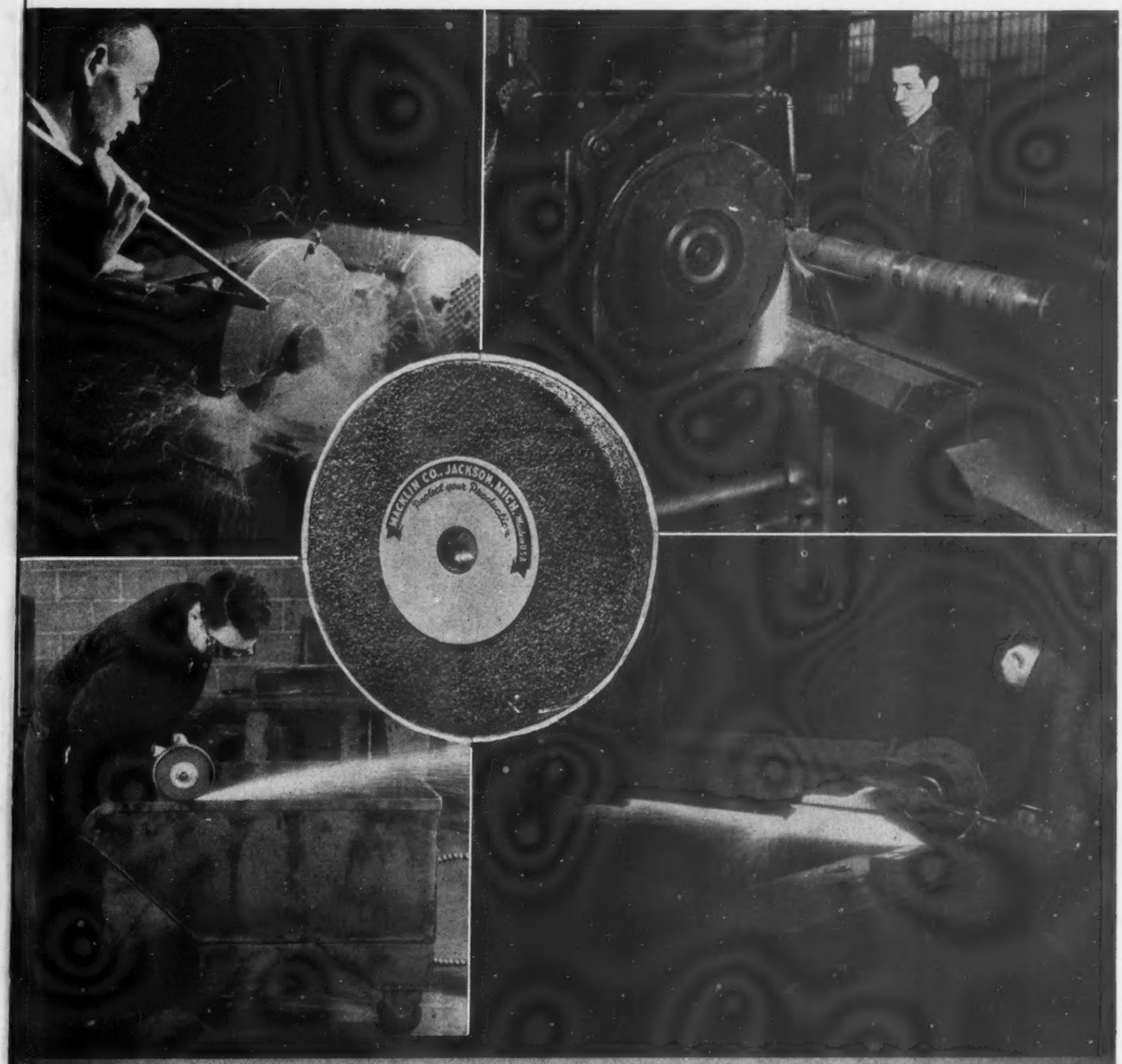
American BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO.



MACKLIN GRINDING WHEELS are used in all industries. Regardless of whether your grinding operation calls for the tiniest internal wheel or any size up to a 42 inch diameter, MACKLIN can fill your requirements. Get MACKLIN uniformity and *"Protect Your Production."*

ASK FOR THE SERVICES OF THE MACKLIN FIELD ENGINEER.

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

BEHIND THE SCENES

Sample of Postwar Business

■ Add to your list of outstanding company magazines, *GM Folks*, published monthly by General Motors. We were reading in it the other day that when GM gets the go ahead some happy day in the future, orders will flash by telegraph across the country covering initial requirements for 500,000 automobiles. Here is a rough idea of what these first orders will cover:

1,600,000,000 pounds of steel
348,000,000 pounds of iron
86,000,000 pounds of rubber compound
53,000,000 pounds of glass
43,000,000 pounds of upholstery materials
40,000,000 pounds of paint and thinner

Art Critic

■ There have been hundreds of stories about Charles M. Schwab, who never became too rich or important to enjoy friendly comradeship with his old employes in the mills. But until the other day we had never heard the one about his coming by the open hearths one morning and stopping to watch a sturdy old laborer, naked from the waist up, glistening with sweat, shining in the glare of the furnace fires.

"Harry," exclaimed Schwab, "you look like an old Rembrandt."

"Hello", rejoined the old man, "you don't look so hot yourself this morning, Charlie!"

$64 Word

■ If you were stopped cold, as we were, in reading the Industrial Equipment section of the February 19 issue when you came to "stoichiometrically", don't lose any sleep over it. We went to the big Webster's and discovered that it simply means the art or process of calculating the combining of weights of the elements or the treating of the laws of chemical combination and of the relations between the properties of substances and their composition.

Rehabilitation in Cleveland

■ One of the most interesting stories STEEL has ever published is due to begin this coming week and continue in two additional installments. It is a story of the wonderful work being accomplished through a program sponsored by Lamson & Sessions in the training and rehabilitation of returned veterans at Crile hospital. They have an actual shop set up at the hospital, with especially designed machines, and the veterans work at 75c an hour as they are trained back into a useful occupation. Other manufacturers in the Cleveland district are going to follow through with similar programs and we know you'll want to read this series carefully.

Reprints Exhausted

■ Occasional orders are still coming through for copies of the reprint book of "Metallic Materials", ten thousand copies of which are now in use throughout the industry. Our supply is completely exhausted and present plans are not to put it back on the press at this time.

There are, however, still copies of "Metallic Arc Welding Electrodes" available from the Readers Service Department at a dollar each. But don't wait too long, they're going fast too.

Materials Work Sheets

■ Speaking of reprint books, we'd like to put in a plug for our good sister publication, *Machine Design*, on its new loose-leaf Materials Work Sheets booklet. These Work Sheets appear regularly every month and the complete series from October, 1943 through December, 1944 have been made available in this convenient form, at $1.00 per set. The continuing series will be reprinted at the end of every year for addition to the binder.

Many engineering departments are putting a copy into the hands of each man and to help on this substantial discounts are made on quantity orders. If you're interested address *Machine Design*, Penton Building, Cleveland 13.

Dilemma

■ **Getting out a column is fun but it's no picnic.**
If we print jokes, people say we are silly.
If we don't, they say we are too serious.
If we clip things from other magazines, we are too lazy to write them ourselves.
If we don't we are too fond of our own stuff.
If we don't print contributions, we don't appreciate true genius.
If we do print them, the page is filled with junk.
Now, like as not some one will say we swiped this from some other magazine—we did.

Machine Tool Study

■ By now, all the returns, except a few late stragglers, are in on STEEL's study of machine tools. We certainly want to express our sincere appreciation for the excellent co-operation from all through the industry, and from the rough tabulation already made we feel sure you will be amply repaid by the helpful information the study contains. The report will appear in STEEL as soon as the editors complete their detailed tabulations and analysis.

Protocol Problems

■ We never quite realized all the protocol involved in setting up some of the industry advisory meetings down at WPB, until we happened to be sitting in an office there last week when the guy in charge of arrangements came in to settle a few details. Just whom to have sit where presented quite a problem but after some discussion it was agreed they all be arranged alphabetically around the table. Then it came out that one of the gentlemen was hard of hearing and no one could remember which was his good ear, whether to have him facing the chairman or the committee, or what. We never did hear just what they did with him because just then our man sent out word he could see us.

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Editorial Contents—Page 83

Which of these two men will produce the most work?

THESE two turret lathe operators are just about equal in every qualification—physique, experience, skill, and ambition. They are each working on the same type of Warner & Swasey turret lathe, producing exactly the same finished part.

Yet, at the end of the day, one operator will have produced about 20% more work—yes, and be less fatigued than the other fellow.

The reason lies wholly in the fact that the one operator has a power chuck wrench on his Warner & Swasey—the other has to chuck and release his pieces manually. Heaving and pushing on a chuck wrench takes time—and it takes a lot out of your operators, too. The result is a production sag as the day wears on.

Every superintendent or foreman who has power chuck wrenches on some of his turret lathes and not on others knows how much easier power chuck wrenches make it for their men. They know, too, that the increased production that comes from equipping their Warner & Swaseys with power chuck wrenches quickly pays for the improvement — in many cases in as little as 60 days.

Find out what Warner & Swasey Power Chuck Wrenches can do for you. Talk to your Warner & Swasey field man, or write Warner & Swasey, Cleveland, Ohio.

WARNER & SWASEY · CLEVELAND, OHIO

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

NEW Alliance

GIANT GANTRY CRANES BY

ENGINEERING DATA ON
THE GIANT GANTRY CRANE

SPAN — 90'

LOAD — 270 TONS

EASY ACCESSIBILITY TO ALL PARTS OF THE CRANE BY MEANS OF STAIRWAYS

2 TROLLEYS — EACH 135 TONS

2 AUXILIARY HOISTS — EACH 20 TONS

SHORT LEG — 16'

LONG LEG — 44'

To keep millions of kilowatts flowing from the Joe Wheeler Dam of TVA requires gigantic water wheel generators.

To keep these powerful generators humming, huge turbines and many other massive parts have to be moved back and forth along the dam. Hoisting speeds must be controlled with split-inch accuracy, so the ponderous parts can be inched into place if necessary.

This 270-ton Alliance gantry crane, recently installed, combines sturdy, unusual construction with beauty of design. It has alternating current motors and controls, and each hoist has mechanical brakes. This combination, by actual tests, enables the operator to raise or lower the full rated loads of 270 tons, in increments of one-eighth of an inch, a tremendous engineering achievement.

Alliance, world's largest builders of the world's largest cranes, can give you experienced assistance on load problems. Changes in production may require the relocating of some of your cranes. Usually, in such instances, we can adapt your present cranes to the new locations by increasing or decreasing the spans. Check with The Alliance Machine Company for cost-saving recommendations.

★

LADLE CRANES • GANTRY CRANES • FORGING MANIPULATORS • SOAKING PIT CRANES • STRIPPER CRANES • SLAB AND BILLET CHARGING MACHINES ★ OPEN HEARTH CHARGING MACHINES ★

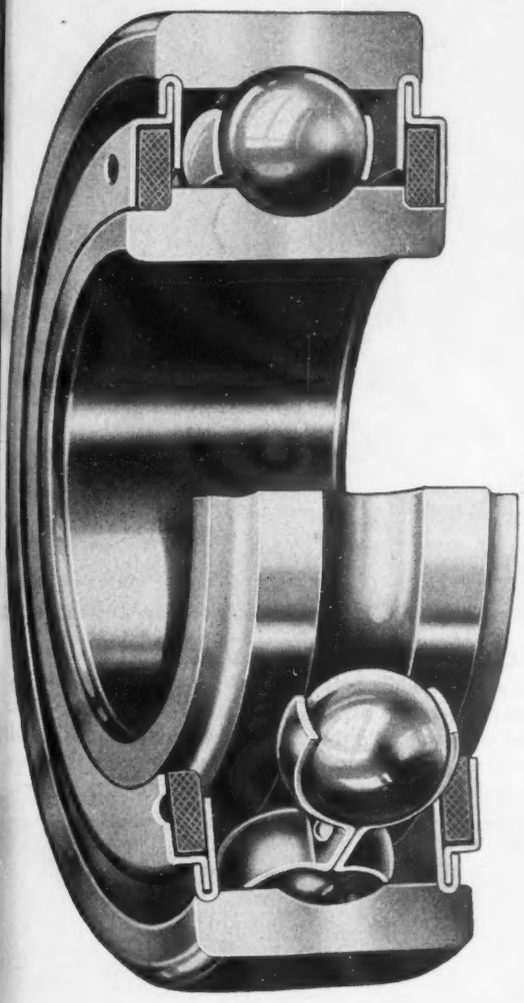
ARMY E NAVY

THE ALLIANCE MACHINE COMPANY • ALLIANCE, OHIO

PITTSBURGH OFFICE : 1622 OLIVER BUILDING

Announcing a SELF-SEALED BEARING

for wider application . . .



The originator and largest maker of self-sealed ball bearings offers further improvements, advanced design, for an even greater range of operating conditions.

Since New Departure introduced the first self-sealed ball bearings less than two decades ago, pyramiding demands have required the production by this company of more than 75 millions of these bearings. Better than words, such figures tell the story of the excellent service ND-seal bearings have delivered in virtually every kind of industry.

But, New Departure has never been content to let "good enough" be the final word. Now, with basic principles retained, an improved bearing is offered, having a new, even more efficient design of seal. This new seal not only prevents entrance of dirt or leakage of lubricant at low speeds or any mounting position — but, it is relatively frictionless and extremely efficient at very high speeds.

. . . AND in addition

a method is provided in these bearings whereby fresh lubricant can quickly revitalize the old, thus vastly extending their utility, and particularly where operating conditions are unusually severe.

This method of refreshing the lubricant does not require removal of the bearing from the housing. Neither does it involve the use of nipples, grease passages, plugs or removable seals. Further details will gladly be sent upon request. Ask for pamphlet IB.

nothing rolls like a ball

NEW DEPARTURE

BALL BEARINGS

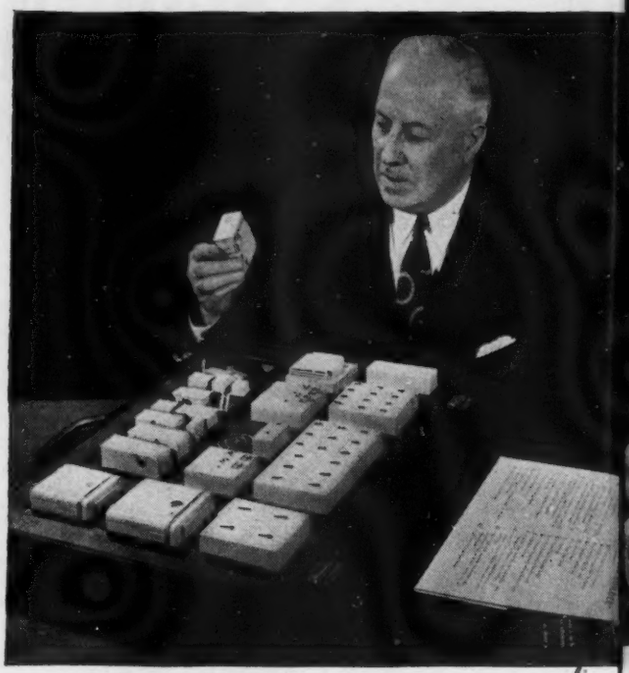
3337

NEW DEPARTURE • DIVISION OF GENERAL MOTORS CORPORATION • BRISTOL, CONNECTICUT

Sales Branches: DETROIT, G. M. Bldg., *Trinity 2-4700* • CHICAGO, 230 N. Michigan Ave., *State 5454* • LOS ANGELES, 5035 Gifford Ave., *Kimball 7161*

New Model Way

Power distribution problems are worked out quickly and accurately when you use Allis-Chalmers "Unit Sub Builder" Set to help with reconversion, expansion, plant modernization planning. Accurate scale models make it possible for you to *see* available equipment, *see* the various ways it can go together, *see* how the *right* unit substation will look in your plant.



1 **YOU SEE WHAT'S AVAILABLE.** Allis-Chalmers "Unit Sub Builder" Set contains accurate scale models of all A-C substation equipment. Visual planning is simple, practical, fast. You build the answers to your unit sub problems right on the top of your desk . . . without bogging down in charts, tables.

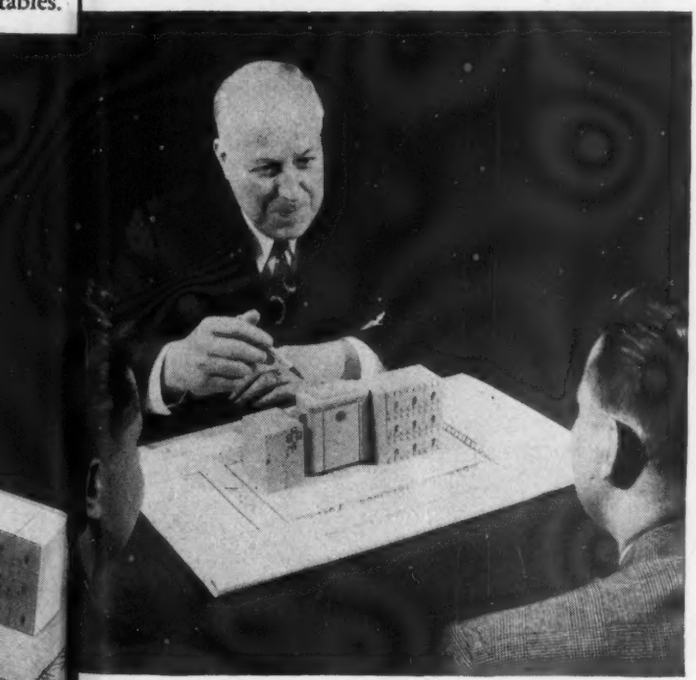
4 **SLIDE RULE** — designed to calculate secondary short circuit current — helps planner determine proper low voltage breakers. After checking load, he determines how many feeder breakers are needed. Here, low voltage unit is being built: first, bus transition, then, three 50,000 amp air circuit breakers.

5 **COMPLETED MODEL** unit substation is easily checked for final space requirements. By sketching a section of his plant on cross-section paper to the same scale as models — ½ in. to 1 ft, planner determines quickly and exactly how much space the unit substation will occupy. All guesswork is gone.

y to Buy Unit Subs

2 HANDY "CHECK LIST" BOOK gives you the added safety of a double check. It helps in the selection of the proper transformer, high and low voltage systems, other considerations when planning a load center unit substation. Weights and dimensions of transformers and switchgear are given.

3 PROPER SELECTION of high voltage switchgear is important. Models show at a glance the large variety of equipment available. Here, unit sub planner selects vertical lift switchgear to get protection and flexibility. He uses drop collar throat to simplify connection to 1,000 kva dry-type transformer.



6 DECISIONS ARE MADE quickly and easily when Allis-Chalmers "Unit Sub Builder" Set is used to show various arrangements that will fulfill the power distribution needs of your plant. It's a simple matter for other men in your organization to visualize how the *right* unit sub will look when installed.

Work out your Unit Sub ideas with

ALLIS-CHALMERS

"Unit Sub Builder" Set

To see how the "Unit Sub Builder" Set can help in your unit substation planning, call your A-C district office for a showing. There's no obligation, of course. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

♪ *Tune in the Boston Symphony, Blue Network, every Sat. Eve.*

A 1829

HAVING MOISTURE TROUBLE?

SIMPLY APPLY UNIBESTOS

it's simple to apply!

Unibestos efficiency is unaffected by excessive moisture—is ideal for outdoor work or underground mains. Even when Unibestos is soaked, moisture can be steamed off without damaging its structural strength. No shrinking or sagging—Unibestos remains snug and firm against the pipe—thus always assures maximum protection with a minimum of heat loss.

Available in half-section form up to 30" pipe diameter and in quarter sections from 32" to 60", in thicknesses from ¾" to 5". Single layer construction available for service up to 1200°.

UNION ASBESTOS
MEANS PROGRESS IN INSULATION
AND RUBBER CO.

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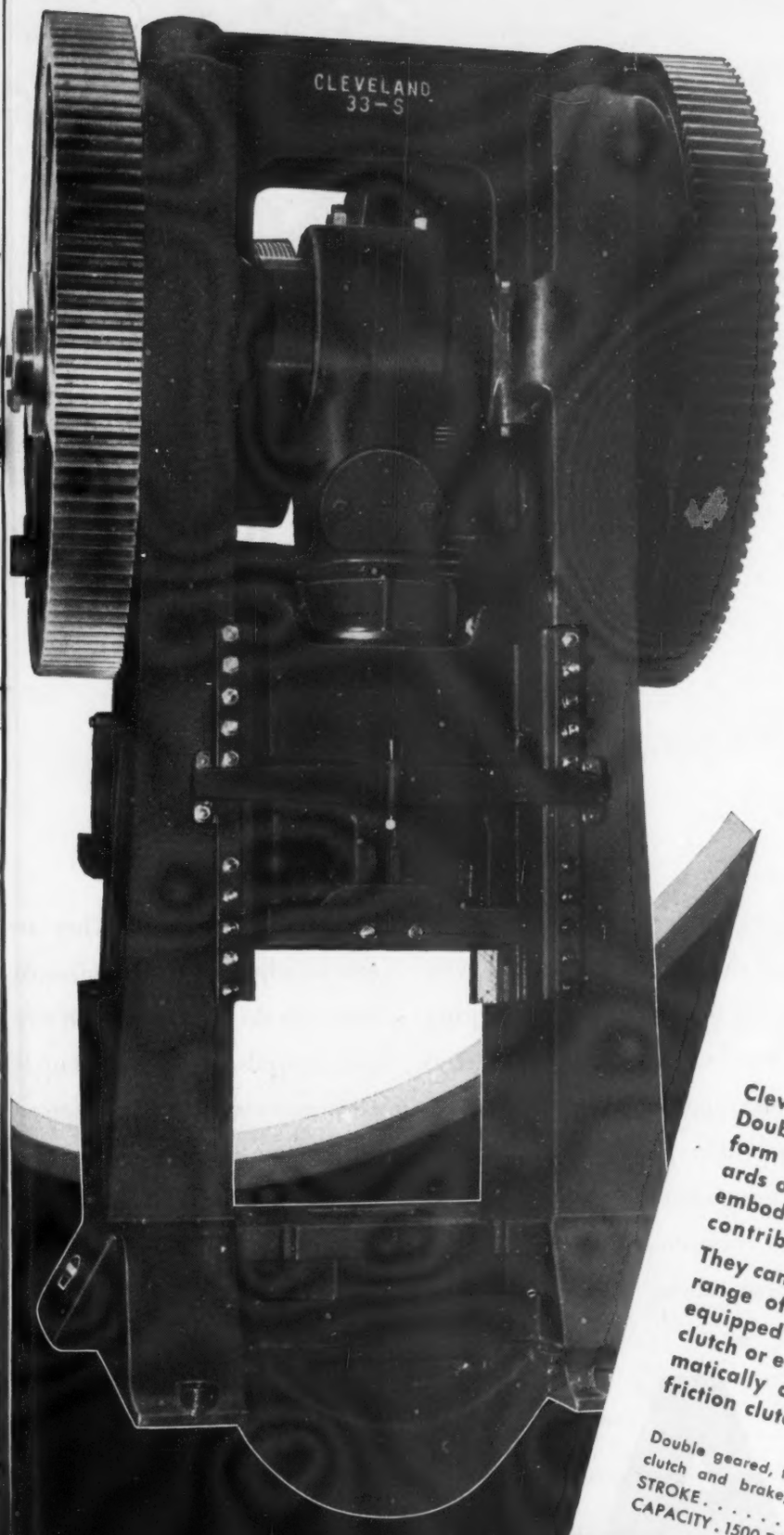
UNION ASBESTOS AND RUBBER CO.

PLANTS: 1821 S. 54th Ave., CICERO, ILL. • PATERSON, N. J. • BLUE ISLAND, ILL.
OFFICES: CHICAGO • NEW YORK • SAN FRANCISCO • PATERSON, N. J.



CLEVELAND Straight Sided Single Crank PRESS

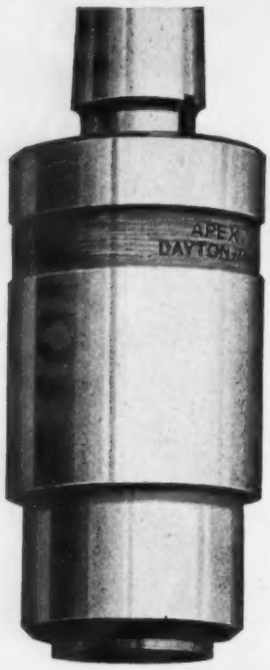
Cleveland Straight Sided Single and Double Crank Presses are built to conform to modern engineering standards of design and construction and embody many improvements which contribute to operating efficiency. They can be furnished in a very wide range of sizes and capacities and equipped with treadle operated jaw clutch or electrically controlled pneumatically or hydraulically operated friction clutch and brake, as desired.

•

Double geared, twin drive, air operated friction clutch and brake, air counterbalance to slide.

STROKE . . . . . 14" ADJUSTMENT . . . 8"
CAPACITY . 1500 TONS BED AREA . . 56" x 56"

THE CLEVELAND PUNCH & SHEAR WORKS COMPANY • CLEVELAND 14, OHIO



In every detail Apex Safety Friction Tapping Chucks are *right*!

You can operate your drill presses and radials to CAPACITY with Apex Safety Friction Tapping Chucks. They minimize tool breaking, save time and materials, and help green hands produce more, faster.

Precision-built throughout, these chucks are made of finest materials for the job. They are easy to adjust and, once adjusted, maintain the proper tension over long periods. End thrust set up by tapping or drilling, or pressure exerted by operator on spindle, does not affect friction setting.

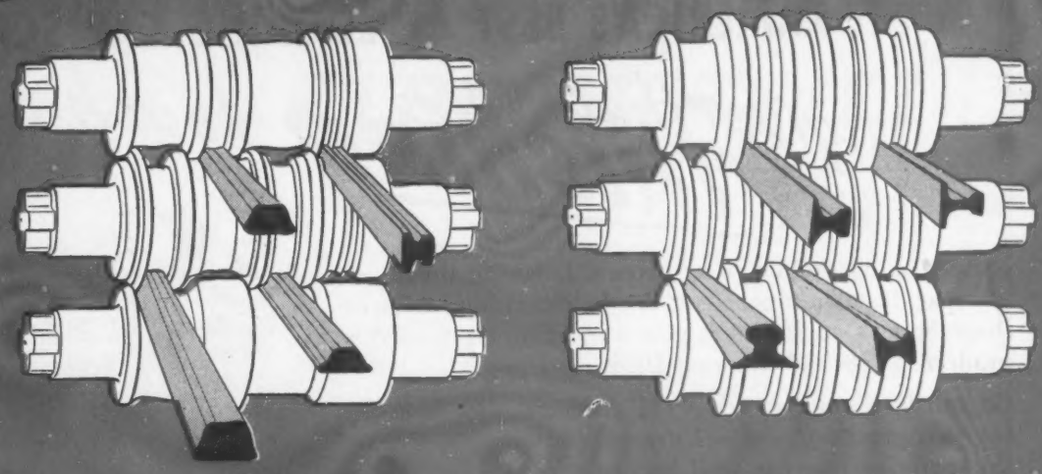
Safe and simple to operate. Send for catalog.

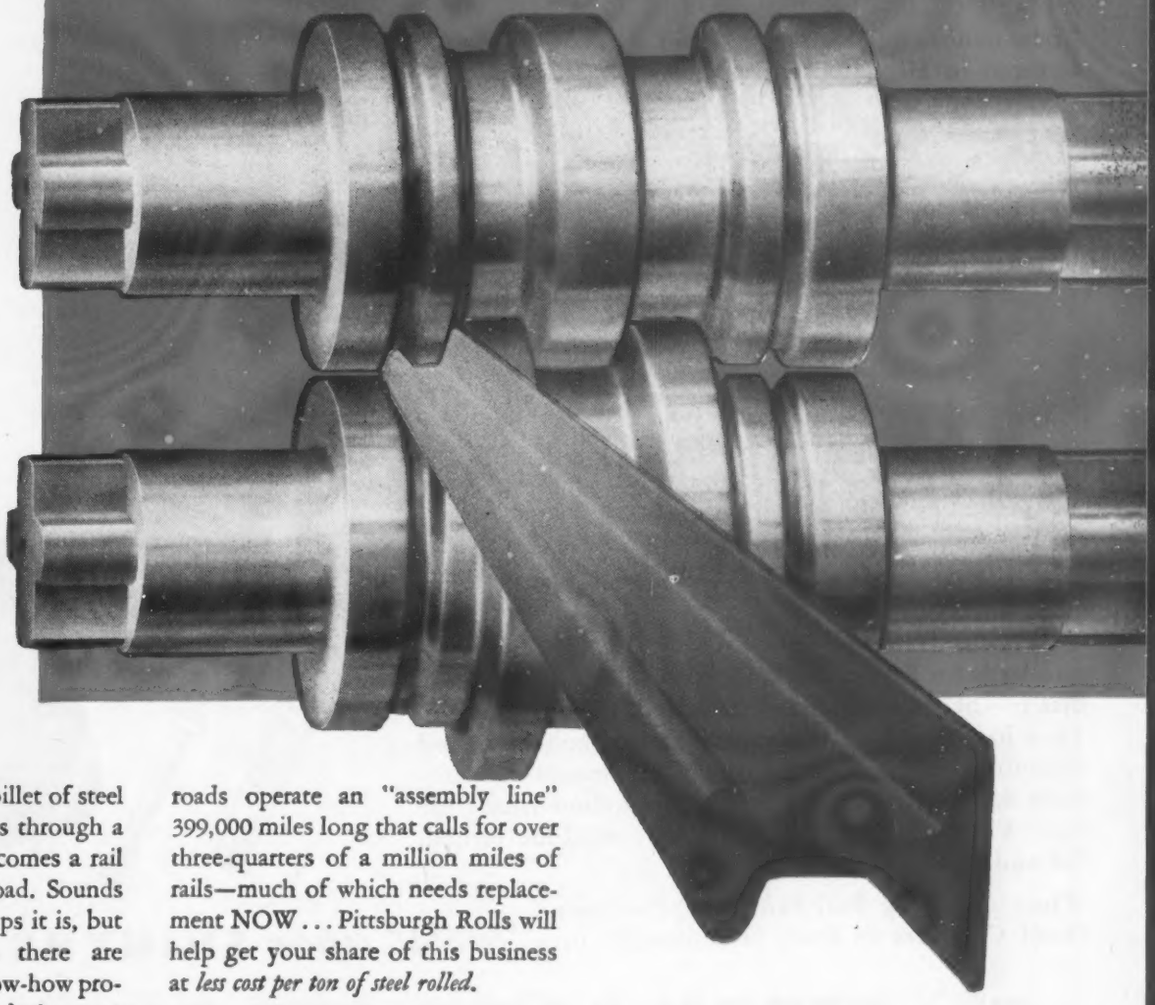
APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws, Aircraft and Commercial Universal Joints, Plain and Universal Joint Socket Wrenches.

ROLLING TECHNIQUE ... RAILS





PITTSBURGH ROLLS 75 YEARS EXPERIENCE 1870 1945

You just take a red-hot billet of steel and pass it 8 or 10 times through a Pittsburgh roll and out comes a rail ready for duty on the road. Sounds simple, doesn't it? Perhaps it is, but behind that simplicity there are several generations of know-how provided by roll-makers and the men who operate them.

Today America's vast systems of railroads operate an "assembly line" 399,000 miles long that calls for over three-quarters of a million miles of rails—much of which needs replacement NOW... Pittsburgh Rolls will help get your share of this business at *less cost per ton of steel rolled.*

PITTSBURGH ROLLS
Division of Blaw-Knox Co.
PITTSBURGH, PA.

PITTSBURGH ROLLS

FERRY

Shinyheads

AMERICA'S BEST LOOKING CAP SCREW

give that Finishing touch...

JUST as chromium plate gives a finishing touch, or sparkle, to a motor car, so do the shiny heads of these Ferry Cap fasteners give a *finishing touch* to this modern Miehle Horizontal Printing Press.

Of sturdy character, SHINYHEADS aid, too, in creating that great *impressional strength* for which this printing press is well known.

These nationally known cap screws are manufactured in High Carbon, C-1038 Steel to standards for Full Finished Hexagon Hand Cap Screws, that is—heads completely machined, top and bottom. They have clean-cut, mirror finish hexagon faces and smooth, bright finished body. The threads are uniform and accurate to close tolerance dimensions for class 3 fit. The point is completely machine turned, flat and chamfered.

Miehle Horizontal Printing Press built with SHINYHEADS

When ordering Full Finished, Hexagon Head Cap Screws from your distributor—*Insist upon* **SHINYHEADS....**

The FERRY CAP & SET SCREW Co.

2159 SCRANTON ROAD • • • • • CLEVELAND 13, OHIO

CAP AND SET SCREWS • CONNECTING ROD BOLTS • MAIN BEARING BOLTS • SPRING BOLTS AND SHACKLE BOLTS • HARDENED AND GROUND BOLTS • SPECIAL ALLOY STEEL SCREWS • VALVE TAPPET ADJUSTING SCREWS • AIRCRAFT ENGINE STUDS • ALLOY STEEL AND COMMERCIAL STUDS • FERRY PATENTED ACORN NUTS

Elbert Hubbard said it . . . **"A Man is Known by the Company He Keeps"**

. . . and so is a LOCOMOTIVE!

65-Ton Plymouth Diesel Flexomotive

The PLYMOUTH FLEXOMOTIVE is as modern, rugged and efficient as the great mills which it serves . . excelled performance for steel mill transportation

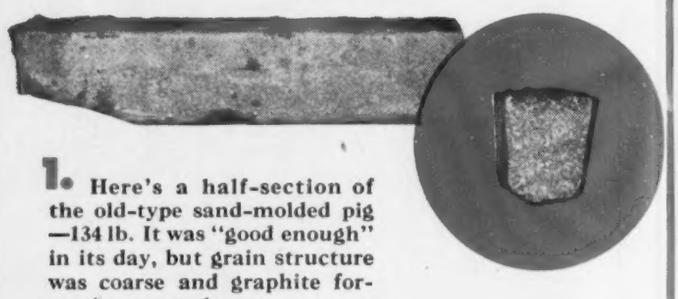
Simple . . Sturdy . . Economical

PLYMOUTH LOCOMOTIVE WORKS

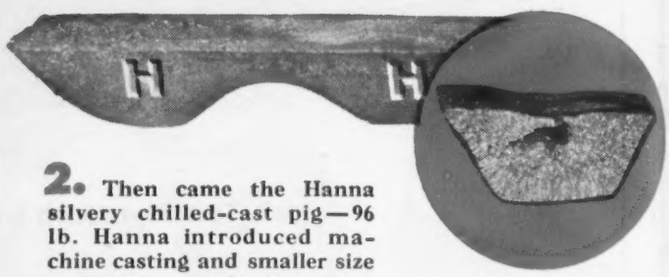
DIVISION OF THE FATE-ROOT-HEATH CO . . PLYMOUTH, OHIO, U. S. A.

We've done a lot with Hanna Iron . . .

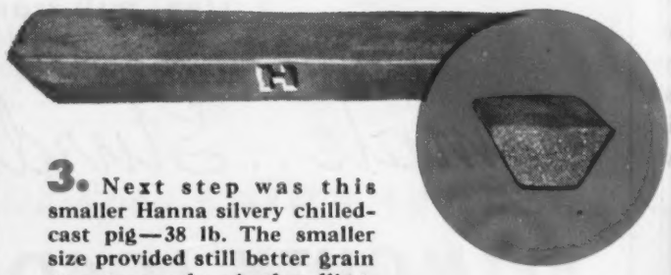
DURING the 75 years that Hanna Furnace has served the foundry industry, our customers have found that they could count on Hanna to be *first* with important developments to give them better iron for better castings. We originated machine-casting of blast furnace silvery iron to provide more uniform quality. We have made continuous progress in controlling crystal growth to insure finer grain structure, contributing to the strength of finished castings. We've worked closely with foundrymen to understand their problems and do something about them! *Now comes another "HANNA FIRST" . . .*



1. Here's a half-section of the old-type sand-molded pig —134 lb. It was "good enough" in its day, but grain structure was coarse and graphite formations were heavy.



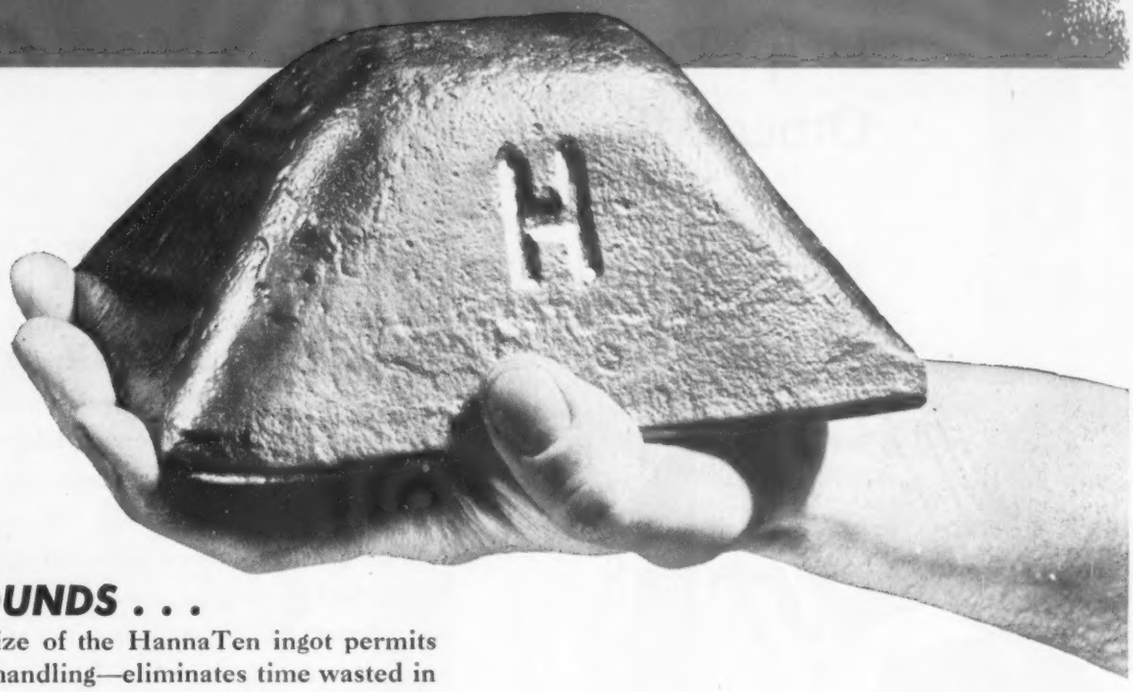
2. Then came the Hanna silvery chilled-cast pig—96 lb. Hanna introduced machine casting and smaller size to improve grain structure for better castings. Graphite pocket was still a problem.



3. Next step was this smaller Hanna silvery chilled-cast pig—38 lb. The smaller size provided still better grain structure and easier handling. The problem of graphite pocket has been pretty well licked.

and now # HANNATEN

SILVERY IRON INGOT



TEN POUNDS . . .

The smaller size of the HannaTen ingot permits more efficient handling—eliminates time wasted in breaking pigs to size—provides more uniform distribution in the melt.

TEN PER CENT SILICON . . .

There's one pound of silicon in each HannaTen silvery iron ingot, to help foundrymen get a balanced mixture—to provide accurate measure for an accurate charge.

With finer grain structure, no graphite pockets and greater flexibility of use, the HannaTen silvery iron ingot represents the latest in a long series of Hanna developments to produce better iron for better castings. We're proud of it—and we are sure our customers will be, too.

THE BEST KNOWN NAME IN IRON

GRADES:
BASIC
SILVERY
FOUNDRY
MALLEABLE
FERRO-SILICON

BRANDS:
SUSQUEHANNA
BUFFALO
DETROIT

THE HANNA FURNACE CORPORATION

BUFFALO • DETROIT • NEW YORK • PHILADELPHIA • BOSTON • CHICAGO

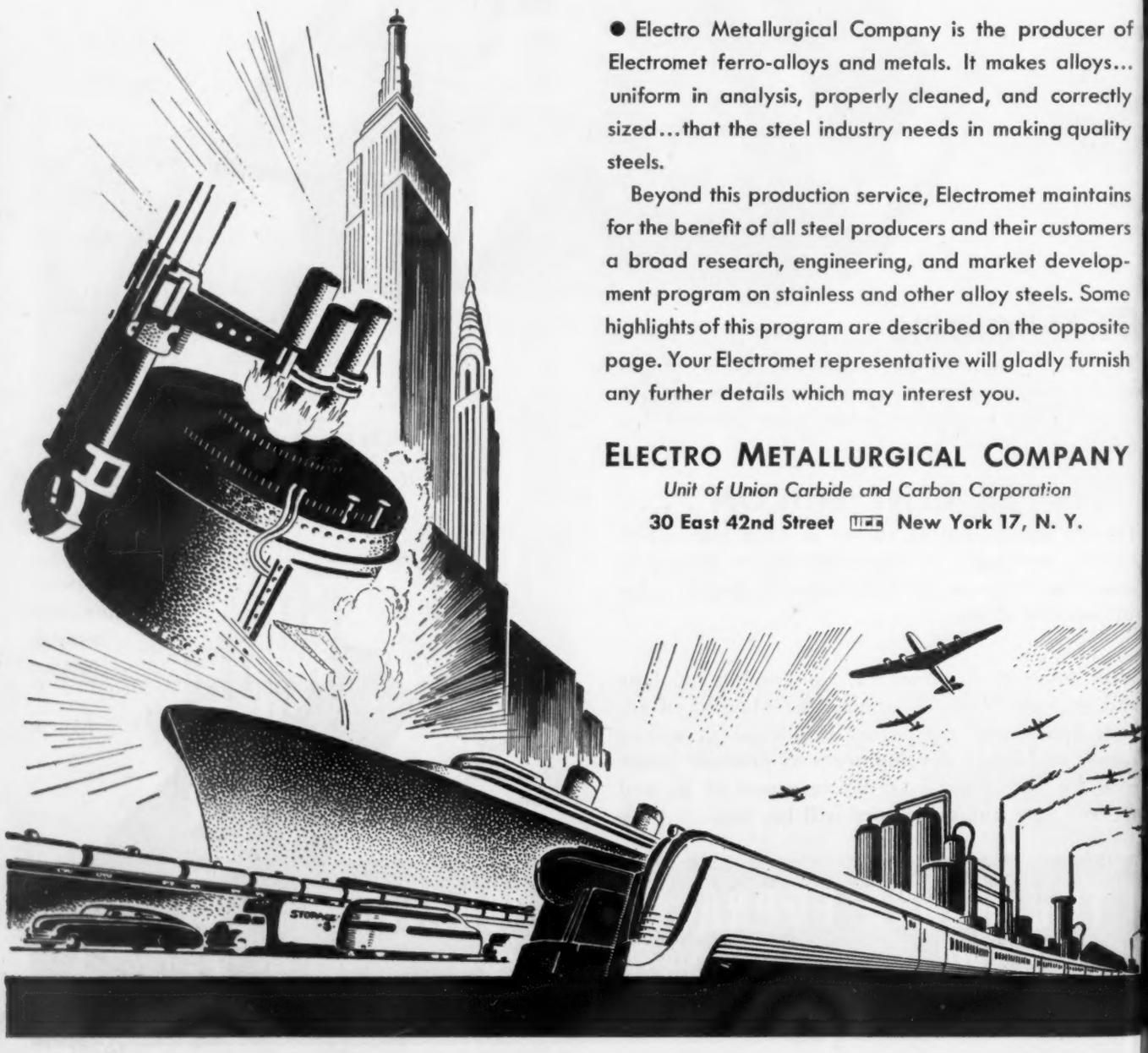
MERCHANT PIG IRON DIVISION OF NATIONAL STEEL CORPORATION

DETROIT PUBLIC LIBRARY

Here are Some of the Ways

Electromet Service

Helps Producers and Users of Stainless and Other Alloy Steels . . .



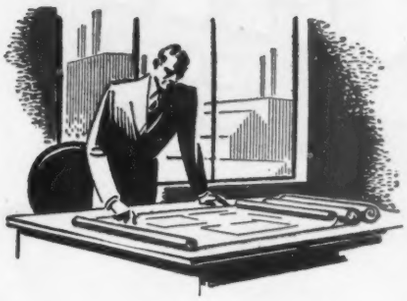
● Electro Metallurgical Company is the producer of Electromet ferro-alloys and metals. It makes alloys... uniform in analysis, properly cleaned, and correctly sized...that the steel industry needs in making quality steels.

Beyond this production service, Electromet maintains for the benefit of all steel producers and their customers a broad research, engineering, and market development program on stainless and other alloy steels. Some highlights of this program are described on the opposite page. Your Electromet representative will gladly furnish any further details which may interest you.

ELECTRO METALLURGICAL COMPANY

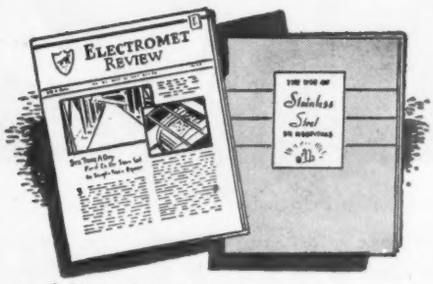
Unit of Union Carbide and Carbon Corporation

30 East 42nd Street UCC **New York 17, N. Y.**



1. *Consulting Engineering Service*— Electromet maintains a staff of experienced metallurgists to help users of stainless and other alloy steels with metallurgical problems associated with the uses of these steels. These men cooperate with the steel companies and their customers in helping select the best type of steel for a particular application.

2. *Research Facilities*— Electromet's consulting engineering service is backed up by a large, well-equipped laboratory. Here new alloy steels are developed and studies are made on the properties and uses of alloy steel. Typical results of this research program are the development of low-carbon alloys, silicomanganese, high-nitrogen ferrochrome and ferrocolumbium.



3. *Publications*— Each month more than 20,000 copies of ELECTROMET REVIEW are distributed to industrial executives. This publication describes in non-technical terms uses and applications of stainless and other alloy steels for men in all industries. Booklets on the uses of stainless steels in hospitals, architecture, aircraft, and process industries are other examples of publications coming from Electromet.

4. *Advertising*— A regular advertising schedule in business papers is maintained to help expand the uses of stainless and other alloy steels in such important fields as the process industries, the food industry, aircraft, hospitals, and textile mills. This market development work is supplemented by direct mail campaigns to other important groups of prospective users of alloy steels.

District Offices: Birmingham • Chicago • Cleveland
Detroit • Pittsburgh • San Francisco.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

BUY UNITED STATES WAR BONDS AND STAMPS

Electromet

Trade Mark

Ferro-Alloys & Metals

IT CAN TAKE IT

When the Army's 155-mm. gun—"Long Tom"—lets go, it has a kick like forty mules. That's reason enough for building the carriage with N-A-X HIGH-TENSILE STEEL. The inherently finer grain structure of this low-alloy steel provides exceptional resistance to impact and fatigue, just as it insures unusual ductility for a metal of such high tensile strength. In bitter cold and tropic heat, N-A-X HIGH-TENSILE STEEL is "taking it" in this exacting application and in other military applications of all types.

IT CAN DISH IT OUT

There's a bonus of "extra yardage"—more earth moved each hour—when N-A-X HIGH-TENSILE STEEL is used for steam shovel buckets. Its great strength permits lighter, more efficient design. Its unusual resistance to wear and impact helps insure long life with low maintenance costs. And not least in importance, its exceptional weldability makes possible a welded construction that stands up under the heaviest punishment. Buckets made of N-A-X HIGH-TENSILE STEEL are "dishing it out" for the armed forces and for civilian contractors.

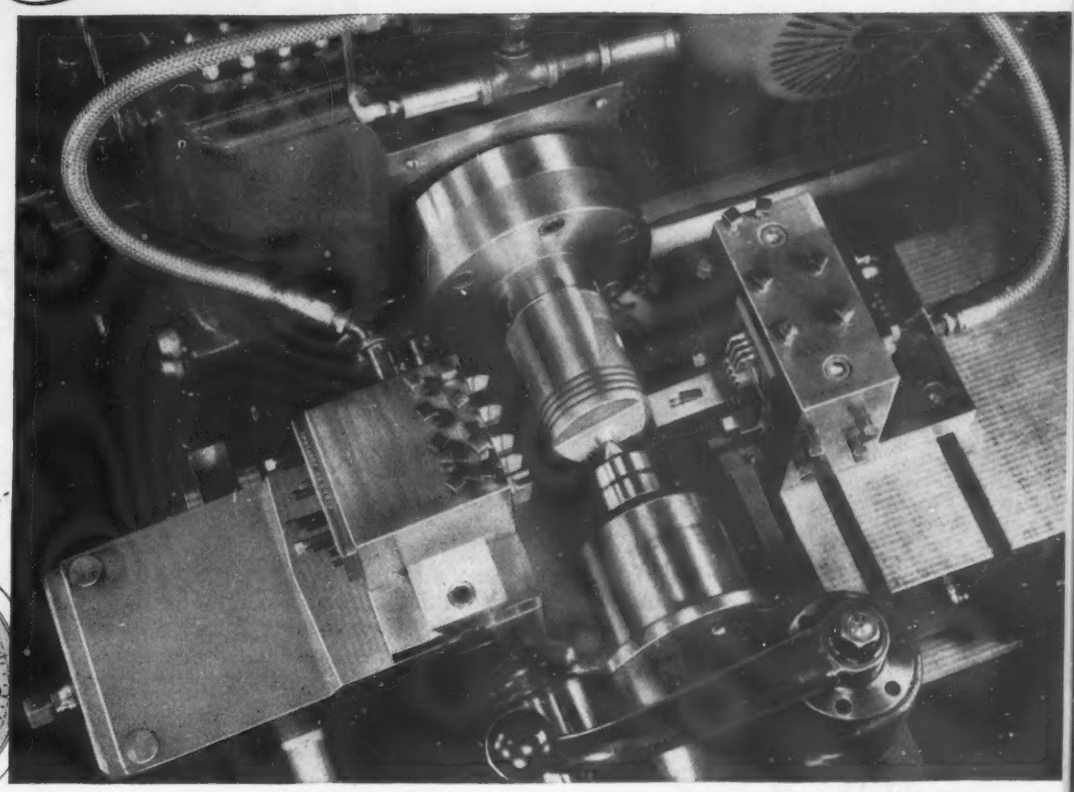
GREAT STEEL FROM GREAT LAKES

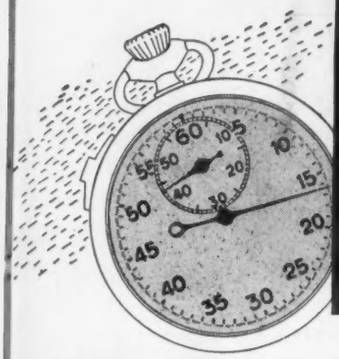
GREAT LAKES STEEL
Corporation

N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN

UNIT OF NATIONAL STEEL CORPORATION

3 pistons per minute!





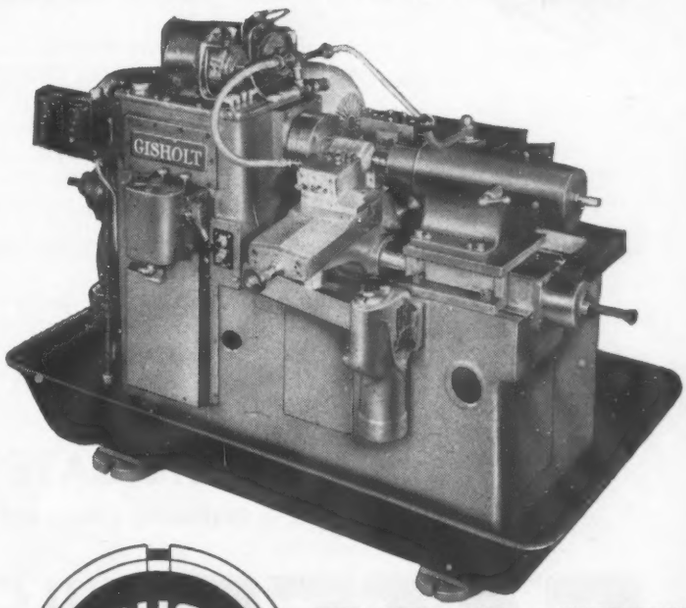
with the GISHOLT HYDRAULIC AUTOMATIC LATHE

This manufacturer, with aluminum pistons to turn out in large numbers, properly assigned the job to the Gisholt No. 12 Hydraulic Automatic Lathe. With the tool set-up shown here, the finish turning and grooving were done at a rate of 180 per hour, net.

Naturally, this calls for high spindle speeds; smooth, even feeds; quick approach and automatic return traverse of tools; easy operating tailstock, and an air-chucking fixture.

Those are the important things about the Gisholt Hydraulic Automatic Lathe. It's flexible, adaptable, fast . . . ready to handle a variety of between-centers or chucking work. And it's so easy to run that the operator has little to do but load the chuck, and remove the work when finished.

The Gisholt No. 12 means rock-bottom costs wherever the volume is sufficient to warrant automatic machining. Literature on request.



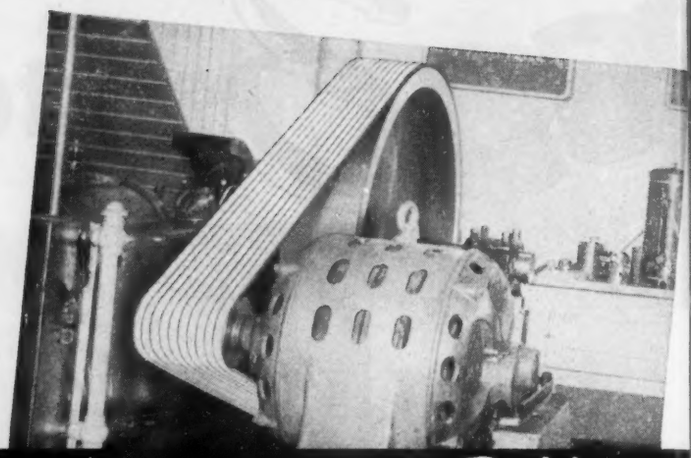
THE GISHOLT NO. 12 HYDRAULIC AUTOMATIC LATHE provides independent feeds for front carriage and rear slides, with an infinite selection of feeds from .000" to .055". Slides feed to positive stops, insuring utmost accuracy in finished dimensions. Elimination of feed gears, mechanical trips, cams, etc., greatly simplifies changes of setup.

GISHOLT MACHINE COMPANY
1217 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . With
Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES



an Important Fact

GATES *Synthetic Rubber* V-Belts

—are *TODAY* Giving *BETTER SERVICE* Than *ANY* V-Belts Built *Before the War!*

and the Reason for it

When our Army's tanks, tractors and self-propelled big guns were being built, it was found that no V-Belts built by anyone before the war could stand the service that is now being delivered on the battlefield by V-Belts that Gates has developed especially for these heavy combat units. And Gates is building these V-Belts entirely of synthetic rubber.

* **The fact that Gates developed these belts—and is building them of synthetic rubber—is important to you now because every improvement developed by Gates for these Army belts has also been added, day by day, to the quality of the Standard Gates Vulco Ropes which are being delivered to you.**

As you know, wartime improvements in many other products must be withheld from general use until after the war is won—but victory depends so directly upon production, and production so directly upon V-Belts which drive the producing machines, that Gates has been able to give you immediately in your Standard Gates Vulco Ropes, every V-Belt improvement which Gates specialized research has developed for use on the Army's motorized equipment.

These are the simple reasons why you are finding that your Standard Gates synthetic rubber Vulco Ropes are today giving you better service than any V-Belts that were ever built before the war.

THE MARK OF Gates SPECIALIZED RESEARCH

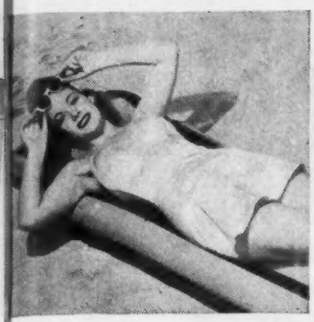
THE GATES RUBBER COMPANY

Engineering Offices and Jobber Stocks in All Large Industrial Centers

453

GATES VULCO ROPE DRIVES

CHICAGO 6, ILL. 549 West Washington. NEW YORK CITY 3, 215-219 Fourth Avenue ATLANTA 3, GA., 738 C. & S. National Bank Bldg.
LOS ANGELES 21, CAL., 2240 E. Washington Blvd. DENVER 17, COLO., 999 S. Broadway DETROIT 4, MICH., 8663 Grand River Ave.
PORTLAND 9, ORE., 333 N.W. 5th Ave. DALLAS 2, TEXAS, 1710 N. Market St. SAN FRANCISCO 3, CAL. 1090 Bryant St.



SUN GLASSES

SKIING GLASSES

SWIMMING GOGGLES

WELDING GOGGLES

IN METALS TOO
It all depends on what you want to do

SELECTION GUIDE TO INCO NICKEL ALLOYS

PROPERTY:	MONEL	"R" MONEL	"K" MONEL	"KR" MONEL	"S" MONEL	NICKEL	"Z" NICKEL	INCONEL
CORROSION RESISTANCE	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
STRENGTH	GOOD	GOOD	HIGH	HIGH	GOOD	GOOD	HIGH	GOOD
TOUGHNESS	GOOD	GOOD	HIGH	GOOD	GOOD	HIGH	HIGH	HIGH
HARDNESS	GOOD	GOOD	GOOD	GOOD	HIGH	FAIR	HIGH	GOOD
MACHINABILITY	GOOD	HIGH	GOOD	HIGH	GOOD	GOOD	GOOD	GOOD
NON-GALLING	NO	NO	NO	NO	HIGH	NO	NO	NO
SPRING PROPERTIES	GOOD	NO	HIGH	NO	NO	GOOD	HIGH	HIGH
ELEC. CONDUCTIVITY	POOR	POOR	POOR	POOR	POOR	GOOD	GOOD	POOR
HEAT RESISTANCE	GOOD	GOOD	GOOD	GOOD	HIGH	GOOD	GOOD	HIGH
HEAT TREATABLE	NO	NO	YES	YES	YES	NO	YES	NO
NON MAGNETIC	NO	NO	YES	YES	YES	NO	NO	YES

When it's a question of finding a metal for some tough job you have in mind there is a quick way to look for a ready answer...

Take a look at the family of Inco Nickel Alloys—strong, hard, corrosion-resisting and absolutely free from rusting, every one of them. Those are the family characteristics of the eight Inco Nickel Alloys.

Which one should you choose for your particular job?

It all depends on what you want to do.

From this "Selection Guide" you can see how each one provides a different combination of advantages for different types of work.

Then write for a copy of our List "B-100" which lists more than 100 technical bulletins and publications that explain the properties, corrosion-resisting characteristics and practical applications of these INCO Nickel Alloys. It is yours for the asking.

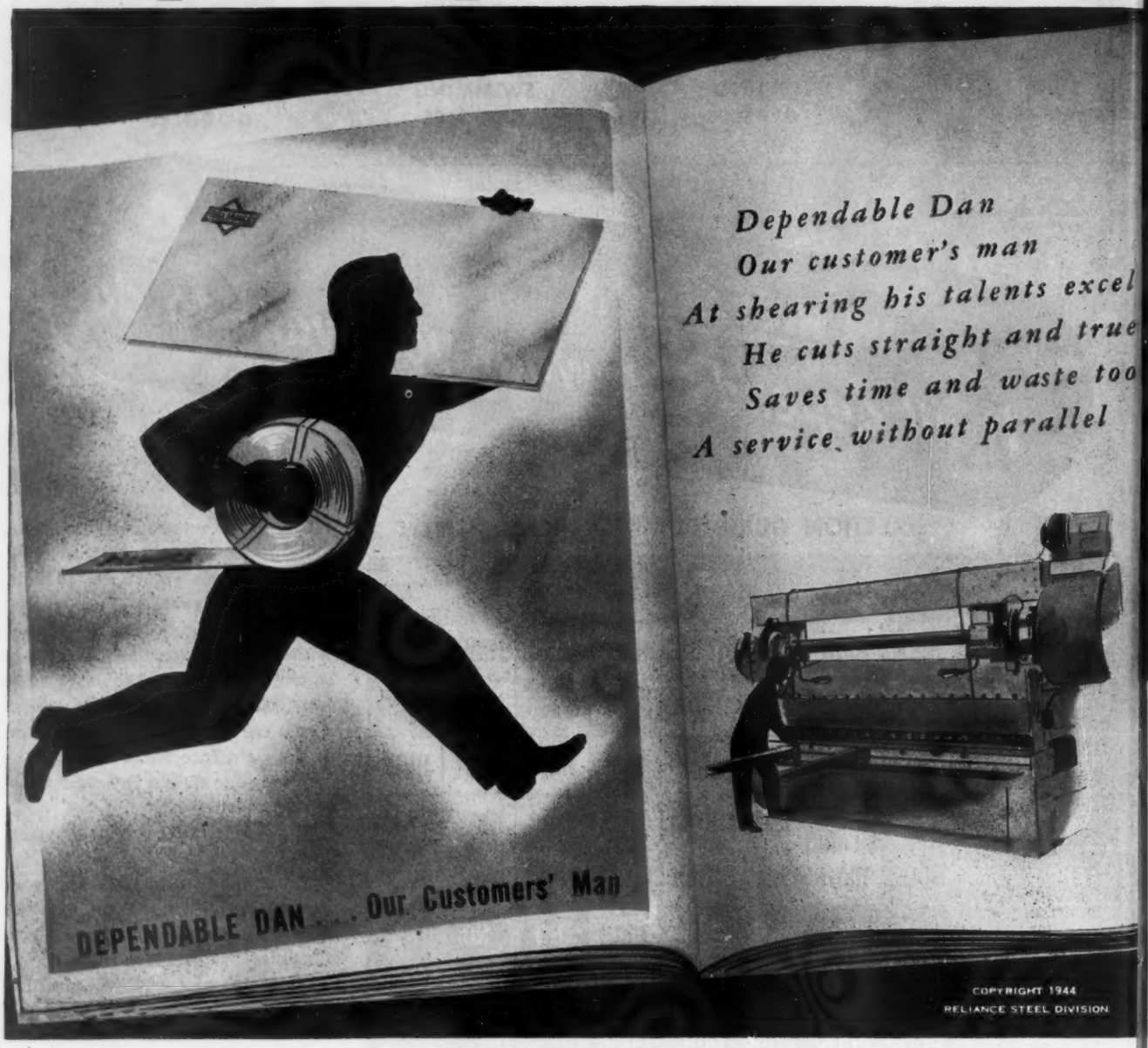
THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

Photo credits (left to right): Ewing Galloway, N. Y.—American Spectacle Co., N. Y.
American Spectacle Co., N. Y.—Black Star, N. Y.

NICKEL (INCO) ALLOYS

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL • "Z" NICKEL • NICKEL • Sheet . . . Strip . . . Rod . . . Tubing . . . Wire . . . Castings . . . Welding Rods (Gas & Electric)

Top Dependability


DEPENDABLE DAN . . . Our Customers' Man
Dependable Dan
Our customer's man
At shearing his talents excel
He cuts straight and true
Saves time and waste too
A service without parallel
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DETROIT STEEL CORPORATION

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First FOR EXTERNAL THREADING . . .

PLAN-O-MILL with *Exclusive* Offset Head

THREE definite advantages are yours when you use Plan-O-Mill's exclusive Offset Head for external thread milling.

1. Lower cutter cost.
2. Longer cutter life.
3. Better cutting control.

With Plan-O-Mill's exclusive Offset Head you can use a small, solid, low-cost cutter to mill external threads over 1½" in diameter. Shown above is a typical application.

Plan-O-Mill is a high production machine for internal and external threading and form milling. It is fast, accurate and economical, producing work of exceptional finish. General Electric Thy-motrol gives separate and complete control of feed-in and feed-around—enables one operator to handle two or more machines.

For war or postwar production, turn now to Plan-O-Milling. Ask your machinery dealer for details or write direct.

Five Firsts

1. First to install General Electric's remarkable new Thy-mo-trol electric feed control!
2. First planetary to mill external threads with standard multiple thread cutter!
3. First planetary to coordinate feeds and speeds!
4. First to provide absolute control of feed-in!
5. First to offer a practical, low cost carbide thread milling cutter!

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

PLAN-O-MILL CORPORATION

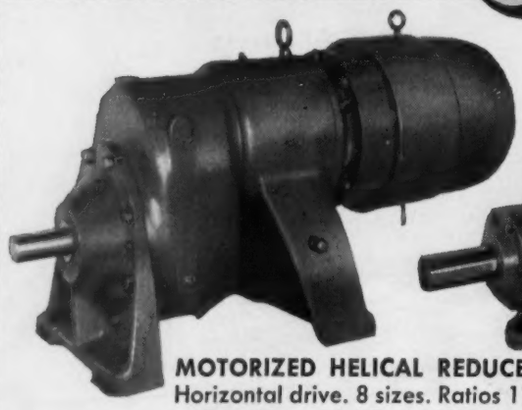
1511 E. EIGHT MILE ROAD • HAZEL PARK, MICHIGAN

THREAD AND FORM PLAN-CO MILLING CUTTERS

Established 1888

D.O.James

MOTORIZED SPEED REDUCERS

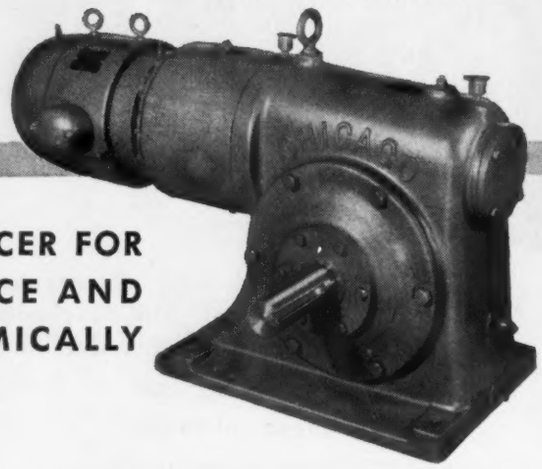


MOTORIZED HELICAL REDUCER
Horizontal drive. 8 sizes. Ratios 1¼ to 9:1. ¾ to 50 HP. 1458 RPM to 128 RPM.

MOTORIZED PLANETARY REDUCER
Horizontal drive. 35 sizes. Ratios 10 to 1200:1. ¾ to 75 HP. 172 RPM to 74 RPM.

MOTORIZED WORM GEAR REDUCER
Horizontal and vertical drive. 11 sizes. Ratios 6 to 65:1. ⅛ to 30 HP. 310 RPM to 25 RPM.

MOTORIZED PLANETARY REDUCER
Vertical drive. 35 sizes. Ratios 10 to 1200:1. ¾ to 75 H.P.
← 172 RPM to 74 RPM.



THE IDEAL GEAR REDUCER FOR LIMITED FLOOR SPACE AND IS OPERATED ECONOMICALLY

MOTORIZED → HELICAL REDUCER
Vertical drive. 8 sizes. Ratios 1¼ to 9:1. ¾ to 50 HP. 1458 to 128 RPM.

The design and manufacture of D.O.James motorized reducers embodies all the high quality of construction of our standard gear reducers. In addition to this in-built quality you have many advantages — such as compactness, lower cost and elimination of separate supports, thereby saving valuable floor space. D.O.James Motorized Reducers are manufactured to drive up, down, horizontally or at an angle.

D.O.James

Over 57 years makers of every type of gear and gear reducer.

D. O. JAMES MANUFACTURING CO.
1140 W. MONROE STREET, CHICAGO, ILL.

Umbrellas are not always for weather protection. To the Navy the "umbrella" is the protecting layer of five-inch anti-aircraft gun fire during enemy attacks, an "umbrella" that keeps heavy bombers high and ineffective.

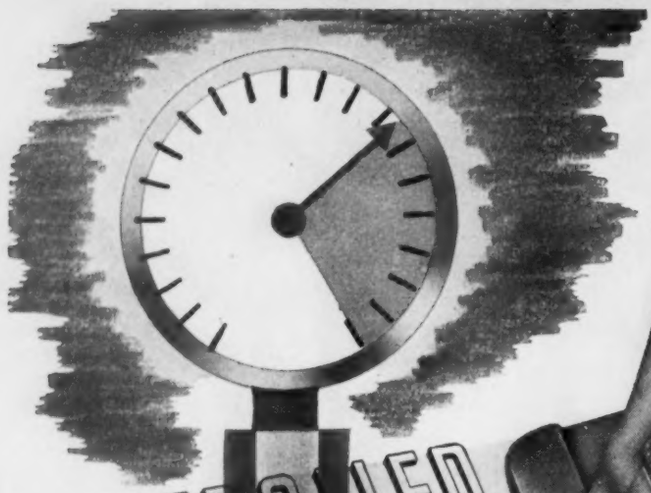
Bases, carriages and slides for these remarkably accurate Navy guns, welded and machined at Danly, are mounted on Navy ships throughout the world . . . important proof of the value of precision welded steel fabrication.

DANLY MACHINE SPECIALTIES, INC.

2100 SO. 52nd AVE. CHICAGO 50, ILLINOIS

DANLYWELD

Danly Die Sets • Die Makers' Supplies • Welded Steel Fabrication



CONTROLLED COOLING...

gave added strength to this PERMITE PERMANENT MOLD Aluminum Casting

When molten aluminum solidifies inside the metal walls of a permanent mold, the metal surfaces hasten the cooling process. This rapid cooling results in a finer grained casting, with greater tensile strength. Thus, in many cases it is possible to safely reduce the thickness of sections, with a saving in metal, weight and money.

Increased tensile strength is but one of the important advantages of the permanent mold process. As used at Permite, this process produces aluminum castings of precise dimensions, uniformly maintained. Permite Aluminum Castings, produced in permanent molds, can be held to a dimensional tolerance of ± .010", compared to the standard of ± .030" for sand castings.

Low production costs and advanced refinements are essential for products planned for today's markets. One of our technical representatives will be glad to show how Permite Permanent Mold Aluminum Castings may help you attain these essentials in your products. Recommendations and estimates submitted without obligation.

ALUMINUM INDUSTRIES, Inc.
CINCINNATI 25, OHIO

Detroit: 809 New Center Building
Los Angeles: 324 North San Pedro Street
Chicago: 616 South Michigan Avenue
New York: 9 Rockefeller Plaza
Atlanta: 413 Grant Building

PERMITE ALUMINUM ALLOY CASTINGS

HERE IS OUR COMPLETE

RACO LINE

MILD STEEL ELECTRODES

Type—RACO	7, All Position, Reversed Polarity	AWS E-6010
"	11, All Position, A. C.	AWS E-6011
"	8, General Purpose, Poor Fit-up	AWS E-6012
"	13, General Purpose, Light Gauge	AWS E-6013
"	20, Horizontal Fillets	AWS E-6020
"	5, Deep Grooves	AWS E-6030

HIGH TENSILE STEEL ELECTRODES

Type—RACO	74, All Position, Reversed Polarity	AWS E-7010
"	64, Horizontal Fillets	AWS E-7020

STAINLESS STEEL ELECTRODES

Type—RACOLLOY	18-8, Unstabilized	Type 308
"	18-8Cb, Stabilized	Type 347
"	18-8(1.5% Mo)	Type 316
"	18-12(2-3% Mo)	Type 317
"	18-12(3-4% Mo)	Type 307
"	19-9, For Welding air-hardening steels	Type 309
"	25-12, Unstabilized	Type 310
"	25-12Cb, Stabilized	
"	25-20, Scale-resisting steel	

HARD SURFACING ELECTRODES

Type—RACO 25, 20-25 C Rockwell (Machinable Deposits)
" 45, 40-50 C Rockwell
" 55, 50-60 C Rockwell
RACOLLOY Manganese, Austenitic Manganese Steel

LIGHTLY COATED ELECTRODES

Type—Blue Label, Sull Coated, Manual Welding		AWS E-4510
Type "D" Automatic or Manual Welding		AWS E-4520
Type "D" .30-.40 C, For surfacing		AWS E-4520
Type "M" Automatic Welding		

OXY-ACETYLENE WELDING RODS

Type—Red Label Copper Coated Mild Steel
Red Label Copper Coated Pure Iron
RACO High-Tensile, For High-Tensile Steels

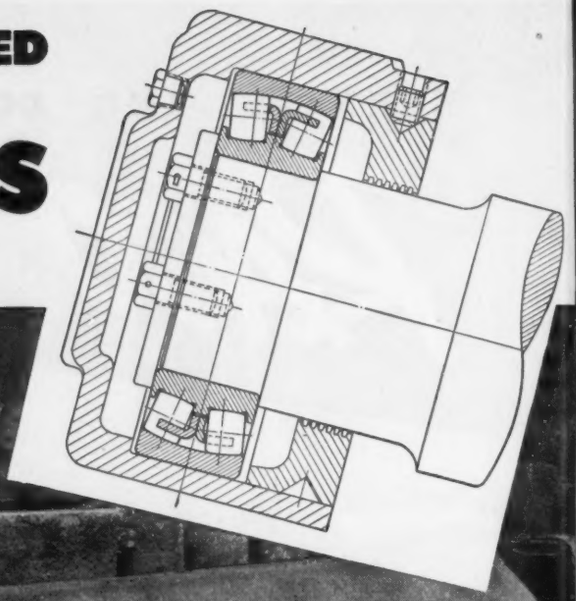
SEND FOR YOUR COPY OF OUR NEW CATALOG JUST OFF THE PRESS

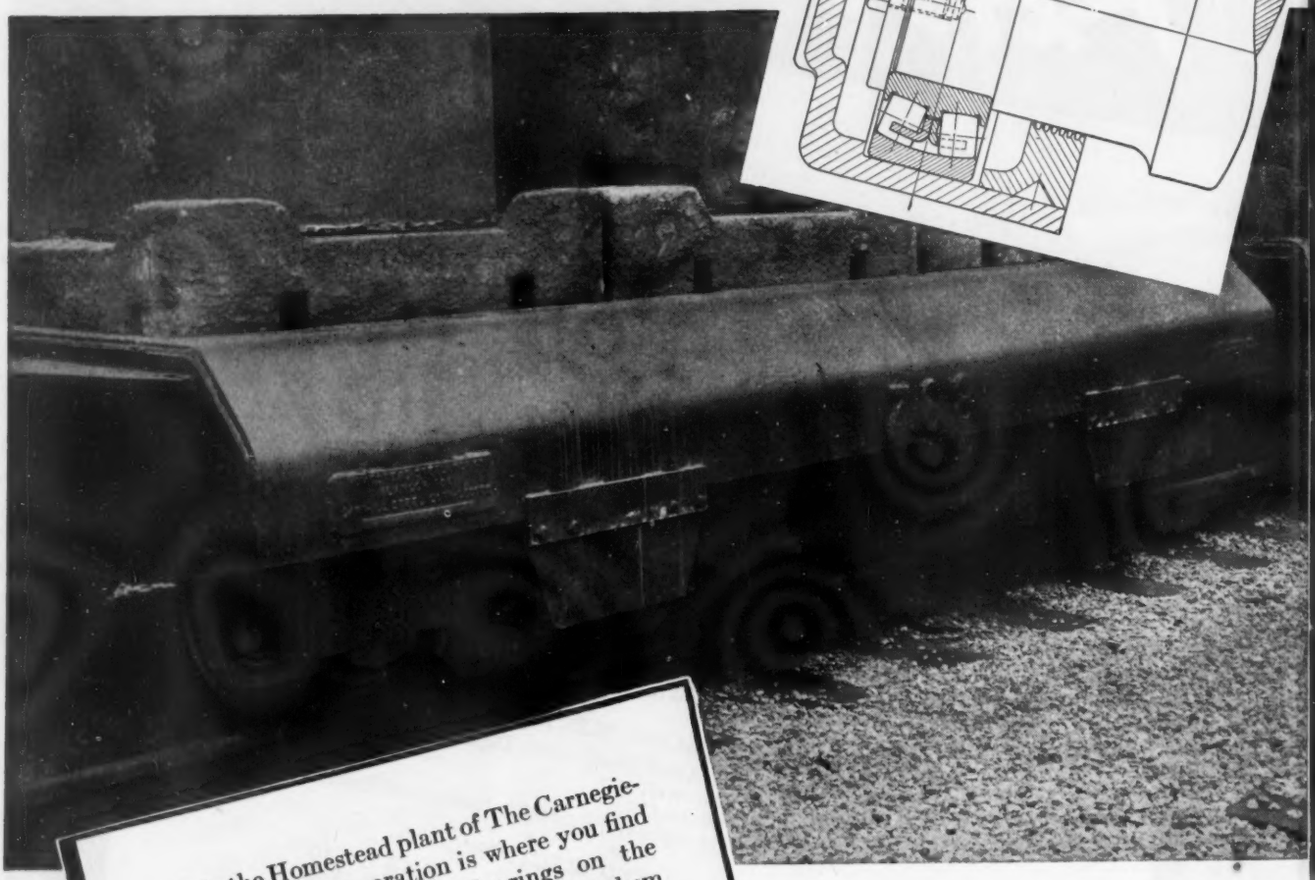
NOTICE TO MANUFACTURERS' AGENTS

The REID-AVERY Company has a few very attractive territories open. Write for complete details.

The **REID-AVERY COMPANY**
INCORPORATED
DUNDALK BALTIMORE 22 MARYLAND
SINCE 1919 PRODUCERS OF ARC WELDING ELECTRODES AND WELDING RODS

WHY SKF's ARE USED ON INGOT CARS





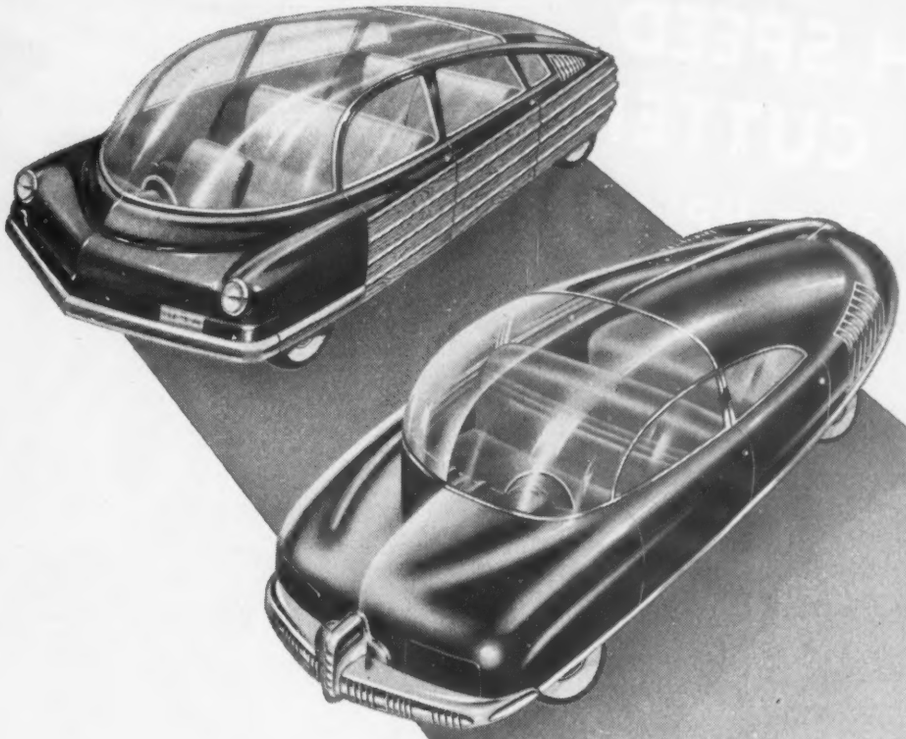
Inside the Homestead plant of The Carnegie-Illinois Steel Corporation is where you find SKF Spherical Roller Bearings on the journals of these ingot cars. You find them there because SKF's have high radial and thrust capacity that overcomes warpage or deflections under heavy shock loads . . . because they have built-in alignment that eliminates binding . . . because they need no adjustments throughout a long life. Steel men with an eye on increased tonnage don't take chances on bearings. They use SKF's.

5761

SKF INDUSTRIES, INC., PHILA. 34, PA.

SKF

BALL AND ROLLER BEARINGS



You'll Soon— Be Seeing Them!

Every day brings the time closer when we'll be viewing the new post-war motor cars.

General appearance may not be so radically changed as some suggest, but you are going to find many improvements in construction.

To assure greater economy in operation and better performance, you will see more extensive use of aluminum and magnesium alloys.

And right here is where the counsel of this organization may be valuable to you. We have a wealth of data covering the use of these light alloys in various applications. Perhaps together we may be able to work out for you a more extensive use of these light alloys than you had thought possible.

BOHN ALUMINUM AND BRASS CORPORATION

General Offices — Lafayette Building, Detroit 26, Mich.

Designers and Fabricators

Aluminum • Magnesium • Brass • Aircraft-Type Bearings

BUY WAR BONDS

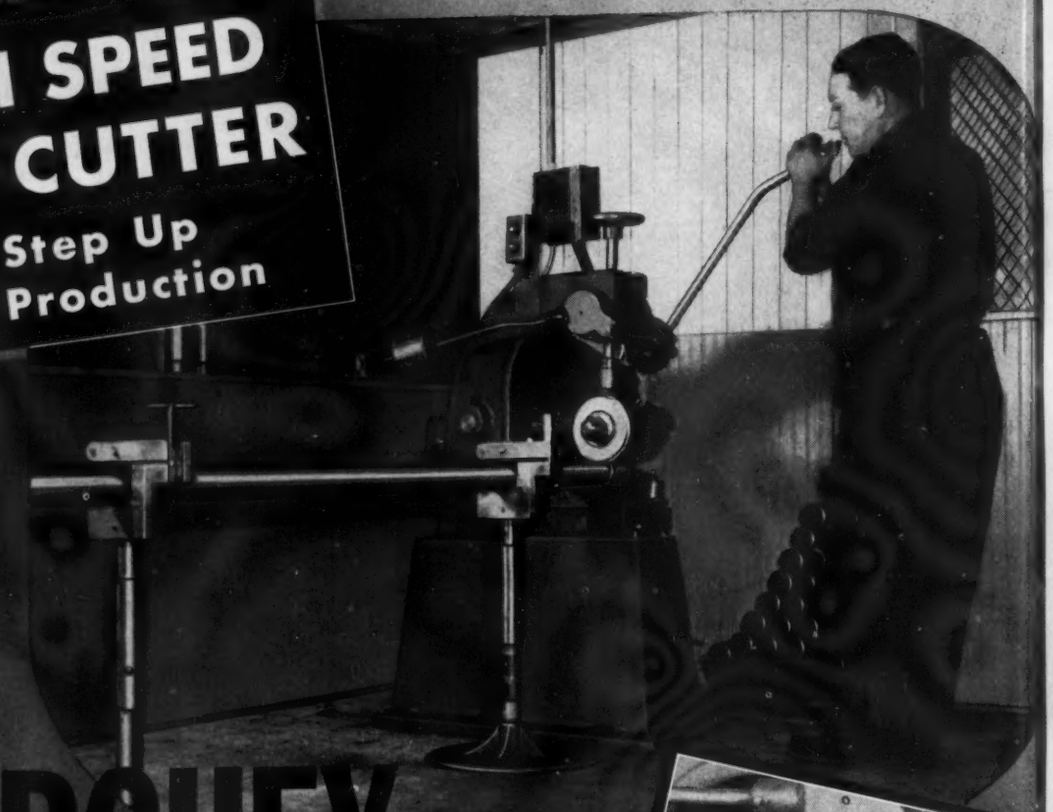
BOHN

You need this

HIGH SPEED PIPE CUTTER

To Step Up Your Production

The photographs illustrate 2½" tubing—¼" wall—9" length. Speed approximately 250 pieces per hour with one man cutting and loading. This machine long in use by Standard Tube Co., Detroit, Mich.

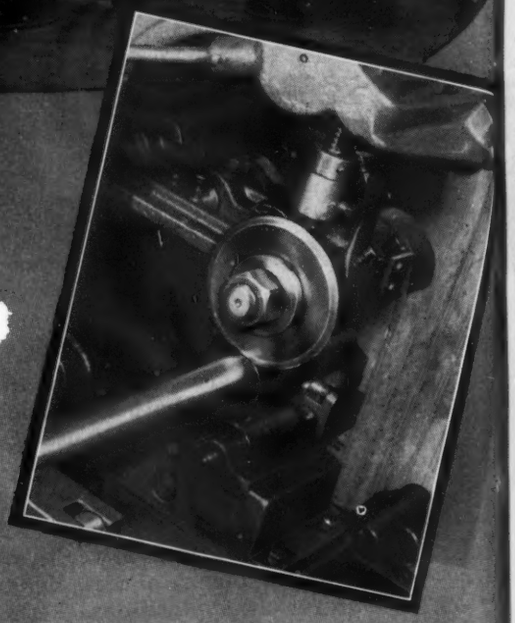


MURCHEY

Model "H"

Heavy Duty Roller Pipe Cutter

The essential machine for war effort. Fits right into the war program. Unsurpassed for cutting off pipes, tubes, locomotive boiler flues. Standard cage of rollers furnished with machine may be quickly removed and replaced by either larger or smaller cage of rollers, to give machine a complete range of from ½" to 6" inclusive. Standard equipment: standard cage of rollers 1½" to 4". Extra cage of rollers can be furnished for ½" to 1½" and from 4" to 6" pipe. On gauge bar, the steel faced gauge arm can be quickly clamped to cut any desired length of pipe. This machine provides clean cutting edge ready for subsequent operation. Accurate cut, both as to length and to squareness. Write or wire for complete information on this or larger machines.



Murchey also manufactures all types of Collapsible Taps, Self-Opening Die Heads, Thread Milling Machines, and Shell Tapping Machines. Write for literature on any or all of these products to Dept. L.

MURCHEY MACHINE & TOOL CO

Detroit 26, Michigan

MURCHEY

Advertisement MARCH, 1945

COPPER ALLOY BULLETIN

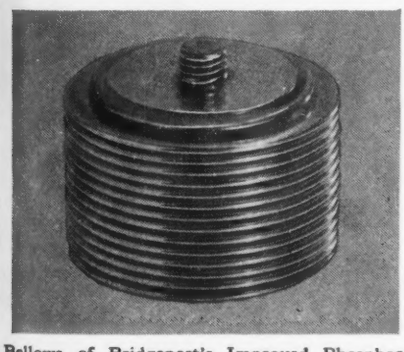
REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared Each Month by the Bridgeport Brass Co. "Bridgeport" *Headquarters for BRASS, BRONZE and COPPER*

Phosphor Bronze for a Higher Dependability Factor

Engineers are paying more and more attention to attaining a higher dependability factor in their products by using materials not subject to sudden failure or deterioration from the effects of corrosion. The use of a slightly more expensive metal for the manufacture of vital parts does not add appreciably to the cost of the article itself, but pays for itself many times over in reduced maintenance and more satisfactory performance. Phosphor bronze is not a new alloy, yet its exceptionally fine properties are essential for the manufacture of the most modern electrical instruments and control devices.

About 1879 it was found that oxides in copper-tin alloys could be practically eliminated by the addition of phosphorus. This produced a material of much greater density, finer grain structure, and one which could be endowed with exceptional spring properties, toughness, and fatigue resistance by cold working. In modern phosphor bronze alloys, the composition of tin ranges from 3-10%, with a trace of phosphorus. The physical properties of this copper-base alloy naturally vary according to the amount of tin and phosphorus present and the type of work to which the material is subjected. When good, sound, homogeneous phosphor bronze castings free from



Bellows of Bridgeport's Improved Phosphor Bronze in Vapor Car Heating Company's steam trap.

oxide and other impurities are carefully processed—rolled into strip by powerful equipment and annealed in modern furnaces, the resulting metal has great fatigue resistance, and can withstand literally millions of flexing motions without failure. Because of this property and the fact that phosphor bronze strip can be stamped and formed into complex shapes without being too hard on the tools, its wide adoption was inevitable for springs in electric switches, alarm systems, jack plugs, telegraph and teletype equipment, time recording devices, etc. Also, because properly made phosphor bronze spring metal can maintain continuous tension and pressure without failure, it found much use as wipers in variable condensers, lock washers, automatic electrical controls and other similar devices.

ANNUAL BULLETIN INDEXES AVAILABLE

The Annual Index to the COPPER ALLOY BULLETIN for the years 1943 and 1944 are now available. Copies will be supplied to interested readers. Those readers now receiving their COPPER ALLOY BULLETIN by mail will automatically receive a copy of the Annual Index for each year.

Other readers who would like additional copies of the COPPER ALLOY BULLETIN for their files or for other reference purposes may obtain them by writing to Bridgeport Brass Company, requesting that their name be placed on the COPPER ALLOY BULLETIN mailing list.

Has Fine Corrosion Resistance

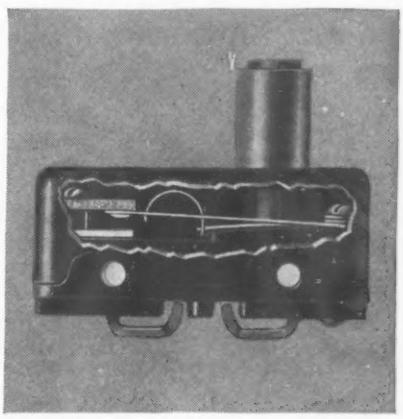
However, although the outstanding spring qualities of phosphor bronze make it ideal for electrical applications, it possesses many other fine characteristics which have won it a high place in other important engineering applications. This alloy has great corrosion resistance, exceptional toughness and high tensile and yield strengths. Moreover, it is not subject to season cracking and has good resistance to certain chemicals, salt water and moist air. Phosphor bronze is used extensively for metal bellows, diaphragms, clutch discs, equipment for handling chemicals, paper and process industries and in sewage reclaiming plants.

Steam Trap

Close cooperation between product designer, engineer and metallurgist will determine just how phosphor bronze can best be used in any given application. For example, the Vapor Car Heating Company had a problem of making a steam trap which would successfully withstand vibration, jarring, temperature extremes and weather. They designed a steam trap with a special diaphragm coupled to a valve, thereby allowing for tight, positive seating against steam pressure and eliminating any tendency to stick. In actual operation on railroad cars, this steam trap must be dependable, and have quick thermal response to conserve steam and prevent moisture in the form of ice and rust accumulating under the car. Quite frequently the steam inside the trap is contaminated by impure boiler water and chemicals. Bridgeport's Improved Phosphor Bronze was selected for the control mechanism because of its toughness, corrosion resistance, and dependable spring action.

Electrical Applications

Still another application is furnished by a switch designed and manufactured by the Acro Electric Company for the control of automatically operated gauging equipment, safety and counting devices, etc. Here, Bridgeport's Improved Phosphor Bronze is assuring top performance of an excellent product by retaining its dependable action under constant flexing of the tongue while the remainder of the spring bends in the opposite direction. Another similar application is the use of Bridgeport's Phosphor Bronze by the Allied Control Company, Inc. in the manufacture of their custom-built relays for radar and electronics equipment, aircraft and submarine controls, etc. Here, flexibility and



Phosphor bronze spring gives Acro switch dependability and long life.

fatigue resistance are of prime importance because these relays have minimum operating requirements of at least a million cycles, and the phosphor bronze contact arms actually vibrate with the speed of a reed.

(Continued on page 2, column 2)

COPPER ALLOY BULLETIN

CAUSES OF CORROSION

This article is one of a series of discussions by C. L. Bulow, research chemist of the Bridgeport Brass Company.

COLD WALL EFFECT
In Relation to Prevention of Stress Corrosion Cracking

Consideration of the mechanism of stress corrosion suggests several ways of preventing cracking due to cold wall effect. Maintenance of a dry surface is advisable wherever possible. For example, stress corrosion cracking rarely occurs in hot water lines because they are generally free from condensate. Insulating cold water pipes also helps to combat outside surface corrosion.

Yellow brasses high in zinc, with either residual or imposed tensile stresses, are more susceptible to this type of corrosion than are red brasses, which are lower in zinc. However, if yellow brass is in the annealed condition and is not subjected to tensile stresses such as might be set up due to bending, loading or twisting, it will not fail from stress corrosion cracking. Red brass or copper is less susceptible to stress corrosion cracking than yellow brass. Certain of the tin, aluminum or silicon bronzes and Cupro nickel are practically immune to stress corrosion cracking.

Cold Wall Effect on Stored Metal

Formation of a condensate on a cold metal surface is not limited to heat exchanger tubes or cold water pipes. Stacks or packages of cold metal, rod, sheet, tubing or fabricated parts in storage may cause precipitation of visible or invisible layers of moisture on their surfaces. The moisture acting with air and its contaminants, such as ammonia and carbon dioxide, or certain wrapping papers may lead to superficial staining, etching or pitting of the metal. The extent of corrosion depends upon the alloy, length of exposure, atmosphere, frequency of condensation, drying and other factors.

To prevent deterioration of metal which is to be stored for some time, it should be protected in one of the following ways: (1) kept in a dry place at a fairly uniform temperature, (2) kept at a temperature higher than the highest prevailing atmospheric temperature, (3) coated with a corrosion-preventing oil or grease, if necessary, or (4) encased in waterproof wrappers.

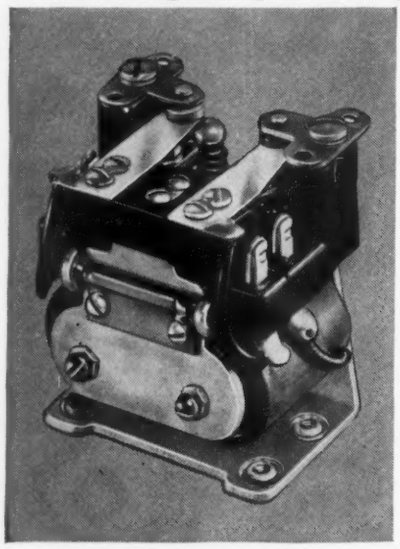
Phosphor Bronze

(Continued from page 1)

Wartime Service

One of the most serious conditions encountered in this war has been the rapid corrosion of ordinary materials used in sensitive, delicate instruments required to operate under extremes of temperature and humidity. Bridgeport's Improved Phosphor Bronze has proved itself specially resistant to this type of attack and is performing valuable service in many types of electrical apparatus used in tanks, bombers and fighter planes, on combat ships, portable radios and similar applications.

Still another important application for phosphor bronze is in the contact spring of the centrifugal starting switch of electric motors, which opens the circuit and prevents the starting winding from burning out. Air conditioners, oil burners, small drill presses, electric refrigerators and similar equipment depend upon electric motors of this type.



Allied Control Company's relay with contact arms of Bridgeport's Improved Phosphor Bronze.

Electric furnace casting, and processing with powerful, up-to-date rolling equipment plus the most careful control of each step in its manufacture maintains consistently the fine quality of this metal. Bridgeport representatives will be glad to consult with engineers regarding possibilities of Phosphor Bronze for postwar products.

NEW DEVELOPMENTS

This column lists items manufactured or developed by many different sources. None of these items has been tested or is endorsed by the Bridgeport Brass Company. We will gladly refer readers to the manufacturer or other sources for further information.

A Foam Making Water Nozzle Automatically combines water, Foam Compound and air to discharge a continuous foam stream for smothering fires in flammable liquids and ordinary combustibles. Three different sizes produce 350, 550 and 1,000 gallons of foam per minute, by physical rather than chemical action. These playpipes which have been supplied in large quantities to our armed forces are now available for industrial protection and fire department use. **No. 593**

Metal Coating Thicknesses are reported to be determined automatically by an instrument described as an automatic dropping unit. The tester is said to measure the thickness of cadmium, zinc, copper, and tin electrodeposits by measuring the difference in the number of seconds required for a solution to penetrate the electro-deposit. **No. 594**

Two New Die Casting Machines featuring high speed and high pressure operation have been developed, one for zinc, tin and lead alloys and the other for aluminum, brass and magnesium alloys. They are designed specifically for high production of smaller castings. **No. 595**

A Non-Metallic Abrasive Facing has been developed for smoothing, leveling or resurfacing metal, as well as non-metallic surface areas, for removing dirt-laden grease or oily metal filings around machinery, for cleaning hands, etc. Unlike steel wool, it will not crumble, crack, shred or disintegrate. **No. 596**

A New Storage Battery Welder is said to spot weld conventional steel, stainless steel, aluminum and similar metal with one third of the total power of conventional stored energy type welders and one twentieth that of alternating current welders. Features include contactor-controller and infinitely variable heat control regulator. **No. 597**

A Steel Disintegrator is reported to remove broken taps, drills, bolts, etc. The disintegrator is chucked in any standard drill press and a tubular copper electrode a trifle smaller than the broken tool is inserted in the device. The broken part is then disintegrated with electric current, it is claimed. Thirty-six disintegrator electrodes are supplied with the equipment. **No. 598**

PRODUCTS OF THE BRIDGEPORT BRASS COMPANY

Executive Offices: BRIDGEPORT 2, CONN.—Branch Offices and Warehouses in Principal Cities

SHEETS, ROLLS, STRIPS—*Brass, bronze, copper, Duronze,* for stamping, deep drawing, forming and spinning.

CONDENSER, HEAT EXCHANGER, SUGAR TUBES—For steam surface condensers, heat exchangers, oil refineries, and process industries.

PHONO-ELECTRIC* ALLOYS—High-strength bronze trolley, messenger wire and cable.

WELDING ROD—For repairing cast iron and steel, fabricating silicon bronze tanks.

LEDRITE* ROD—For making automatic screw machine products.

"Bridgeport" BRASS

Established 1865

BRASS, BRONZE, DURONZE WIRE—For cap and machine screws, wood screws, rivets, bolts, nuts.

DURONZE ALLOYS—High-strength silicon bronzes for corrosion-resistant connectors, marine hardware: *hot rolled sheets* for tanks, boilers, heaters, flues, ducts, flashings.

COPPER WATER TUBE.

FABRICATING SERVICE DEPT.—Engineering staff.

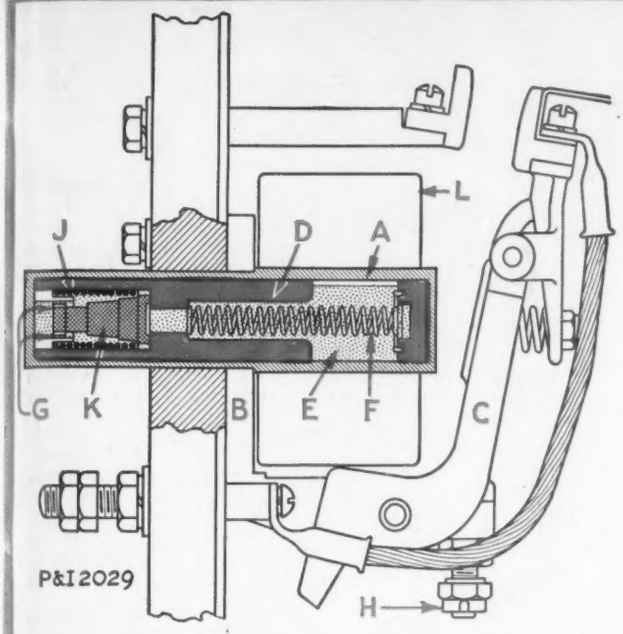
BRASS AND COPPER PIPE

Note: Bridgeport products are supplied in accordance with existing priority regulations.

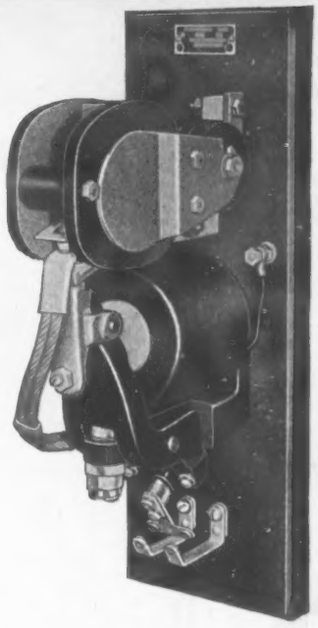
*Trade name.

BRIDGEPORT ARMY E NAVY **BRASS**

TO SIMPLIFY WIRING REDUCE NUMBER OF PARTS USE "3C" BULLETIN 7400 VARI-TIME CONTACTORS



Cross Section of Bulletin 7400, Type RT Vari-Time Contactor in de-energized position



Bulletin 7400 Type RT Vari-Time Contactor

"3C" BULLETIN 7400 Vari-Time Contactors with a built-in adjustable Time-Delay, are ideal D.C. motor accelerating Contactors for your heavy duty jobs.

ADVANTAGES

1. You have no separate Time Relays to maintain.
2. Neither does your Vari-Time element need maintenance nor repairs.
3. You have less panel wiring.
4. You need fewer of all repair parts because wearing parts for main and accelerating contactors are duplicates.

OPERATION

See cross section of V. T. contactor in de-energized position. With Coil L energized, a magnetic flux is set up through brass cylinder A, steel frame B, and steel armature C. Since brass core A is non-magnetic, the armature does not close main contacts until steel plunger D is pulled forward into center of coil. Liquid E opposes this motion until it passes through orifice G.

Time delay is provided by this action.

As steel plunger D nears the center of Coil L, the flux builds up, causing armature C to close the main contacts. Steel Plunger D stays at the front of brass cylinder A as long as Coil L is energized.

Armature C immediately drops open when Coil L is de-energized, and Spring F forces steel plunger D back very rapidly.

3 to 1 timing adjustment is providea by adjustable stop H.

GUARANTEE ON VARI-TIME CORE

Since April, 1937, the following guarantee has been made: —"The Clark Controller Co. will replace, free of charge, any Vari-Time core which will fail in service during the lifetime of the controller."

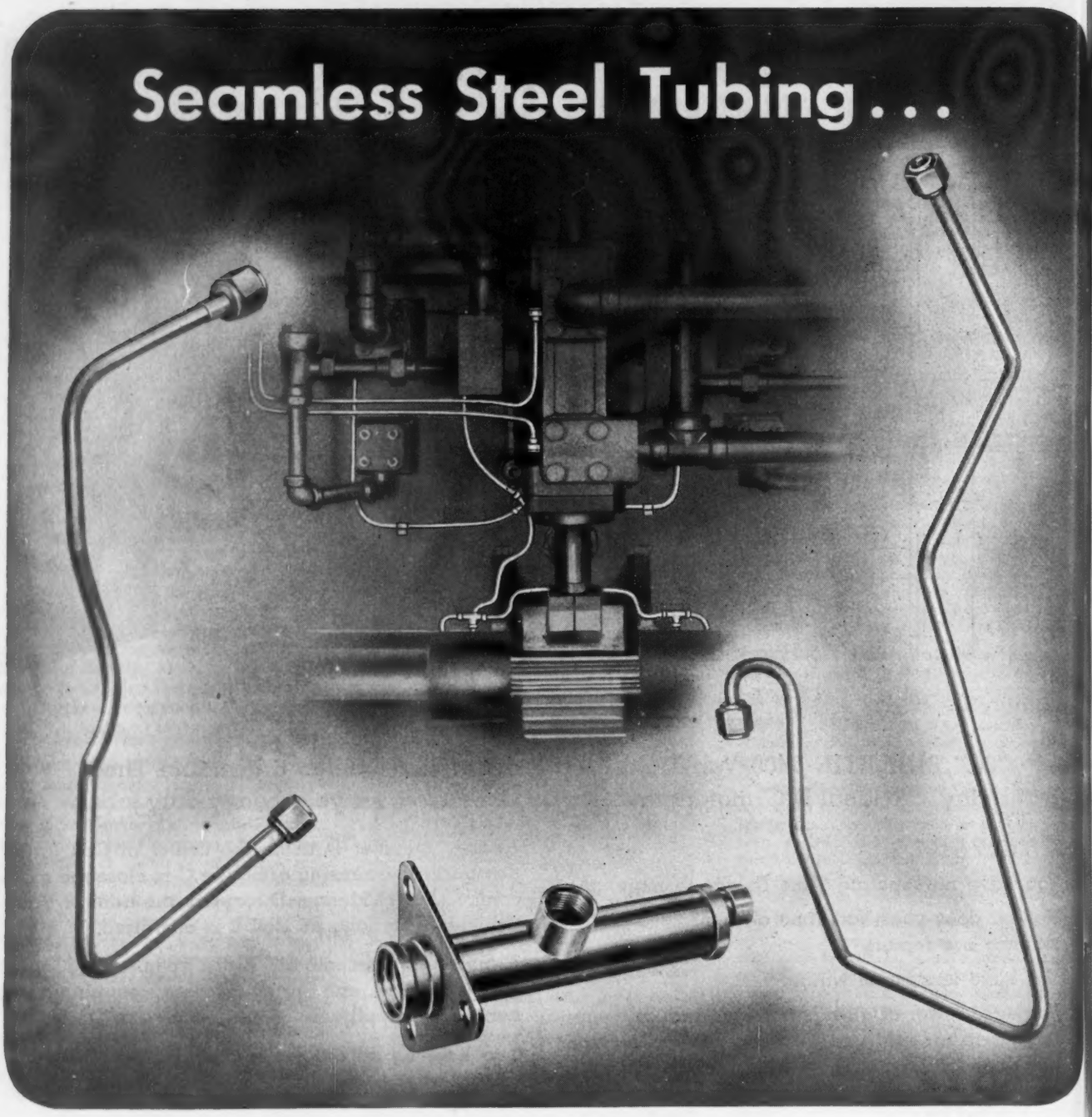
You can look to the "3C" design and its many years of successful use for the reliability you demand in your D.C. Contactors for Heavy Duty applications.

A fully descriptive Bulletin 7400 is yours for the asking.

THE CLARK CONTROLLER CO.

1146 EAST 152nd ST., CLEVELAND 10, OHIO • CONTINUE TO ROLL WITH CLARK CONTROL

Seamless Steel Tubing...



Has Strength For High Pressures

Industrial progress continually calls for hydraulic and lubricating systems that operate at ever increasing pressures and are capable of withstanding rapid reversals and sharp starting and stopping shocks. Cold drawn seamless steel tubing keeps pace with these extreme demands, providing the strength of solid steel walls, plus such other advantages as smooth interior surfaces for free fluid flow; small outside diameters for compact assembly; controlled physical properties to meet exacting pressure requirements.

The long experience of Michigan's laboratory is available to all users of seamless steel tubing.

COLD-DRAWN SEAMLESS STEEL TUBING

AIRCRAFT • MECHANICAL • PRESSURE • STRUCTURAL

MICHIGAN SEAMLESS TUBE COMPANY

SOUTH LYON • MICHIGAN

ARMY E NAVY

Awarded Feb. 12, 1943
First Star Sept. 9, 1943
Second Star May 27, 1944
Third Star Dec. 2, 1944

SPECIFY "GENERAL CHEMICAL"

...dependability and uniformity in metal chemicals

STEEL

PICKLING . . . Sulfuric Acid—Hydrofluoric Acid—Muriatic Acid—Nitric Acid—Phosphoric Acid—Chromic Acid.

Detergents: Sodium Metasilicate—Trisodium Phosphate—Sodium Silicate—Tetrasodium Pyrophosphate.

RIMMING STEEL . . . Sodium Fluoride for smoother surface rimming steel.

COKE BY-PRODUCTS . . . Sulfuric Acid for making Ammonium Sulphate; for washing toluene, benzene, and for treating light oils.

FOUNDRY

Casting Cleaning Acid (Hydrofluoric Acid)—Sodium Silicate—Zinc Chloride—Polyacid Fluorides—Chromic Acid.

Sodium Fluoborate—Ammonium Fluoborate—Potassium Fluoborate, antioxidants and inhibitors.

Potassium Fluoride—Lithium Fluoride and other welding fluxes.

Fluoboric Acid: Solvent for silica, in cleaning surfaces.

HEAT TREATING

Sodium Cyanide—Sodium Fluoride—Sodium Cyanate—Potassium Cyanate.

METAL and ALLOY PLATING

Lead Fuoborate—Tin Fluoborate—Zinc Fluoborate—Cadmium Fluoborate—Copper Fluoborate, etc.

FOR METAL ANALYSES: **BAKER & ADAMSON REAGENTS AND FINE CHEMICALS**

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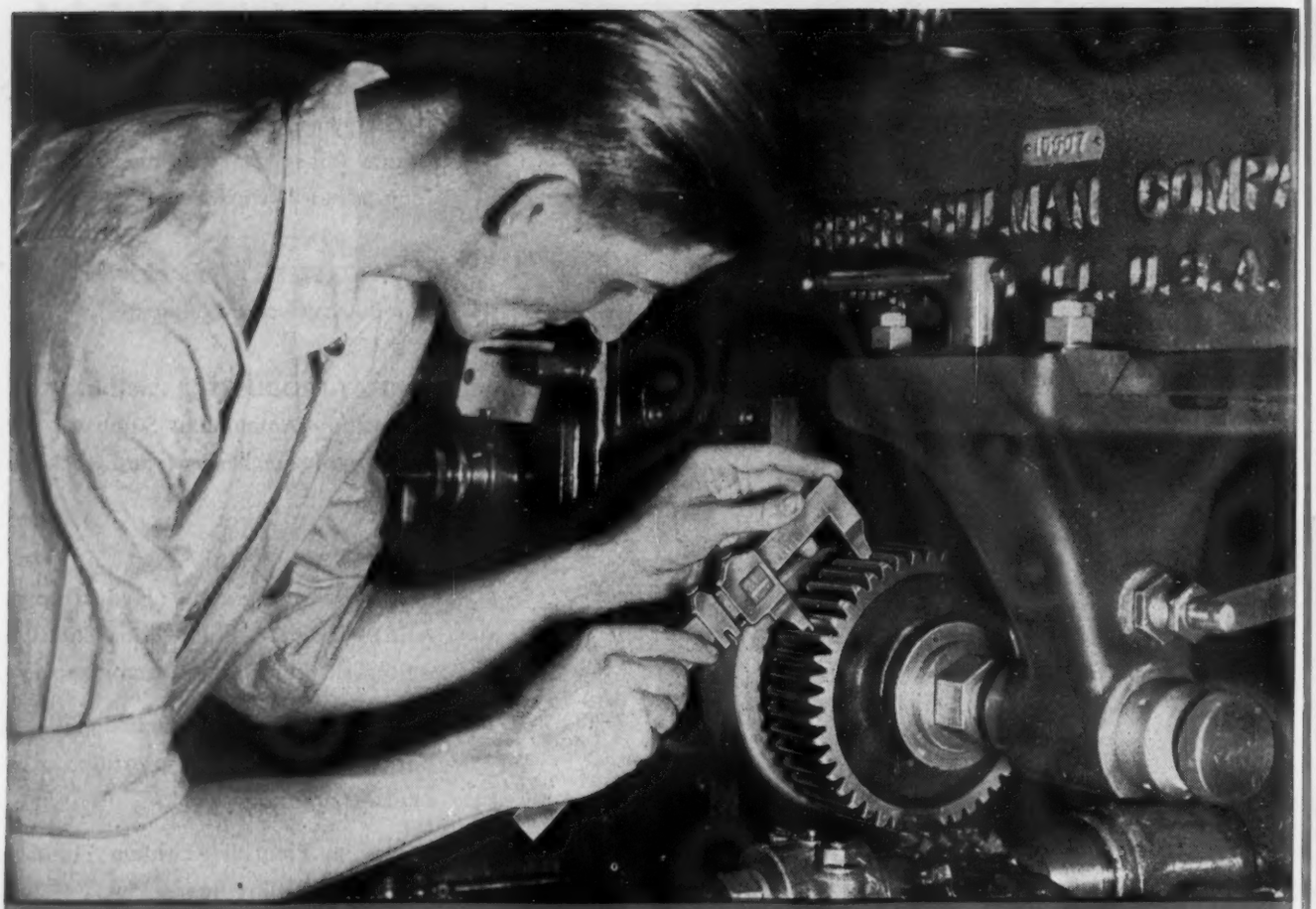


Progress inspection—checking accuracy of tooth spacing and clearance on a spur gear.

Do Gears Have a Personality?

Probably not, but they do reflect the personality of their maker. They can be easy to order, however complex they may be, if the order-taker is competent and experienced. They can be doubly inspected—checked in the machine shop and again before shipping. They can be made under the inflexible supervision of "old timers." They can show a lot of finishing touches that show the maker really cares.

We strive to have our gears reflect the personality of such an organization.

The Illinois Gear trademark on every gear you buy means it's a "Five Star Gear". ★ The material has been carefully double-checked. ★ The gear has been cut by a highly skilled craftsman. ★ Required accuracy has been inbuilt. ★ The gear has been double-inspected after completion. ★ Delivery is as promised.

May we send Catalog 39 showing many types of gears, our production facilities and giving helpful engineering data?

ILLINOIS GEAR & MACHINE CO., Chicago (35), Ill.

ILLINOIS GEARS

ARMY ★ E ★★ NAVY

The mark on Finer Gears

ILLINOIS GEAR & MACHINE COMPANY

3 Specialists WORTH KNOWING

● Steel sheets identified by these trademarks are specialists, made to meet everyday needs particularly well.

Popular SUPERIOR GALVANIZED is uniformly tempered for good workability. It handles well, solders well and is highly uniform—ideal where you need a commercial galvanized sheet. Distinctive CHECKERCOAT is galvanized with bright, checkered spangles. It's a fine sheet where you want smart appearance. Long lasting COPPERIOR is made of copper steel for greater rust resistance.

Both Continental Steel Corporation and its subsidiary, The Superior Sheet Steel Company, produce these well-known galvanized sheets. Ask your jobber about them today.

CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF: MANUFACTURER'S WIRE: Bright, Annealed, Galvanized, Coppered, Tinned, Liquor Finished, Lead Coated, Special wire, etc. Also Chain Link Fence, Nails, etc. STEEL SHEETS: Black, Galvanized, Hot Rolled Annealed, Hot Rolled Pickled, Long Terne, Copperior, Lead-Sealed, Galvannealed, Super-Metal, etc.

THE SUPERIOR SHEET STEEL COMPANY, *DIVISION* • CANTON, OHIO

Special-Purpose Machine Efficiency
at STANDARD MACHINE PRICE

The only reason for buying special machines is to gain special production advantages, yet, these advantages may be available to you at savings of up to 50% of special machine cost.

Here's an example. This Snyder standard 10 V 18 drilling machine is a general utility machine, yet, it can be adapted to do many jobs with "special machine" efficiency, speed, and economy of time and labor, through the use of special fixtures, heads and tools.

The machine shown is used to do a hollow milling job on 20 bosses, using a 5-spindle head and 4 indexes to complete the work cycle.

The index table housing serves as a chip trough and coolant retainer. The standard index mechanism provides the smooth acceleration and deceleration of the Geneva wheel, hydraulically powered from the hydraulic system of the machine itself.

This machine is available with or without special tooling and speed change transmission for single or multiple spindle adaptations. Only the equipment is special, and, with such equipment this machine is the equivalent of a special—at about half the cost of such a machine.

This machine can be readily re-tooled for entirely different production by changing the special equipment only. If production is your problem, write, wire or 'phone *Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Michigan.*

Snyder Standard Drilling Machine with Special Equipment Saves Up to 50% of Special Machine Price

43112

SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

20 Years of Successful Cooperation with Leading American Industries

Design that part in

ArmaSteel*

There's a Message for Tomorrow in This Metal's Wartime Accomplishments

THIS GUN REPORT Should Put You "On the Trigger"

.50-CALIBER MACHINE GUN BARREL SUPPORT

With former material, 15½ lb. of metal had to be removed by machining; with ArmaSteel castings, 1-1/10 lb. In addition, the bronze bushing formerly required was eliminated by ArmaSteel's good bearing qualities.

.30-CALIBER AUTOMATIC RIFLE RECEIVER

Weight of stock formerly used to produce this part—25 lb.; weight of ArmaSteel casting to produce part—9 lb. Machining time by former methods—16 to 18 hours; machining time with ArmaSteel —2 hours.

20-MM. AIRCRAFT CANNON MAGAZINE SLIDE

More than 5 lb. of metal had to be machined off forging formerly used; with ArmaSteel, 1-4/5 lb. was removed by machining. Improved machinability of ArmaSteel effected further savings.

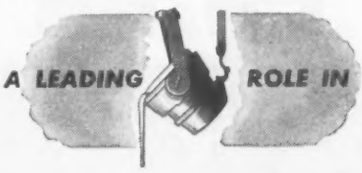
ARMASTEEL PROPERTIES

Adaptability to selective hardening (50 Rockwell C and up). Excellent bearing properties. Good fatigue life. High damping capacity. Takes a mirror finish when polished.

For the time being, let's forget that ArmaSteel had made a name for itself before the war . . . in scores of vital parts for the automotive, Diesel and appliance industries. Instead, let's look at ArmaSteel the way certain manufacturers did when they were "up against it" on big-volume gun contracts.

ArmaSteel had never been used for gun parts before, but what of it? Here was a versatile metal with a wide range of physical characteristics, available in any yield strength up to 90,000 pounds per square inch, and offering properties and qualities that promised results. *Most important of all, it provided 10 to 30 per cent better machinability —cut the amount of metal to be removed to a fraction of former requirements—increased the number of finished parts per tool grind as much as 50 per cent.*

So ArmaSteel "stepped into the breach"—and into more than 60 parts for .30- and .50-caliber machine guns, aircraft cannon, automatic rifles and carbines. It boosted production and cut costs on this assignment . . . *it can do the same in your products.*



CAST FOR A LEADING ROLE IN INDUSTRY

WAR BONDS SAVE AMERICAN LIVES

SAGINAW MALLEABLE IRON DIVISION OF GENERAL MOTORS

SAGINAW, MICHIGAN

•Reg. U. S. Pat. Off

REDUCTION

in a big way!

25 to 50 TONS PER HOUR

A primary metal turnings crusher you can feed direct with a magnet load or orange-peel grab bucket. Product 15" or under, ready for conveying to the blast furnace; for open hearth charging boxes or automatic feeding to secondary crushers; for shoveling size or briqueting.

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"If it's a Westinghouse A-C Welder you can count on it... because it has 60 YEARS OF EXPERIENCE BUILT INTO IT!"

"How do you figure that, Joe? A-c welders haven't been built that long."

"No, but transformers have—and Westinghouse is the outfit that built 'em first and built 'em longest. And any a-c welder is first and foremost a transformer!"

★ ★ ★

Joe is right. When it comes to a-c welding equipment, Westinghouse welders offer the assurance of years of proved design. Westinghouse transformer-type a-c welders incorporate the experience and know-how of 60 years of transformer designing and development . . . experience which began with the first commercial transformers ever built.

And now, with new Westinghouse developments in a-c electrodes and techniques, the benefits of a-c welding have become more widely applicable than ever before.

That's why the combination of Westinghouse a-c welders and electrodes is a top choice for industrial work of all types, from maintenance to heaviest continuous production.

Before you buy, investigate. Westinghouse a-c welders are available in 100, 200, 300, 400 and 500-ampere capacities, and in 750, 1000 and 2000-ampere models for use with the automatic Unionmelt process. Write for Catalog B-3136. Westinghouse Electric & Mfg. Co., Box 868, Pittsburgh, Pa. J-21314

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A-C WELDERS AND ELECTRODES

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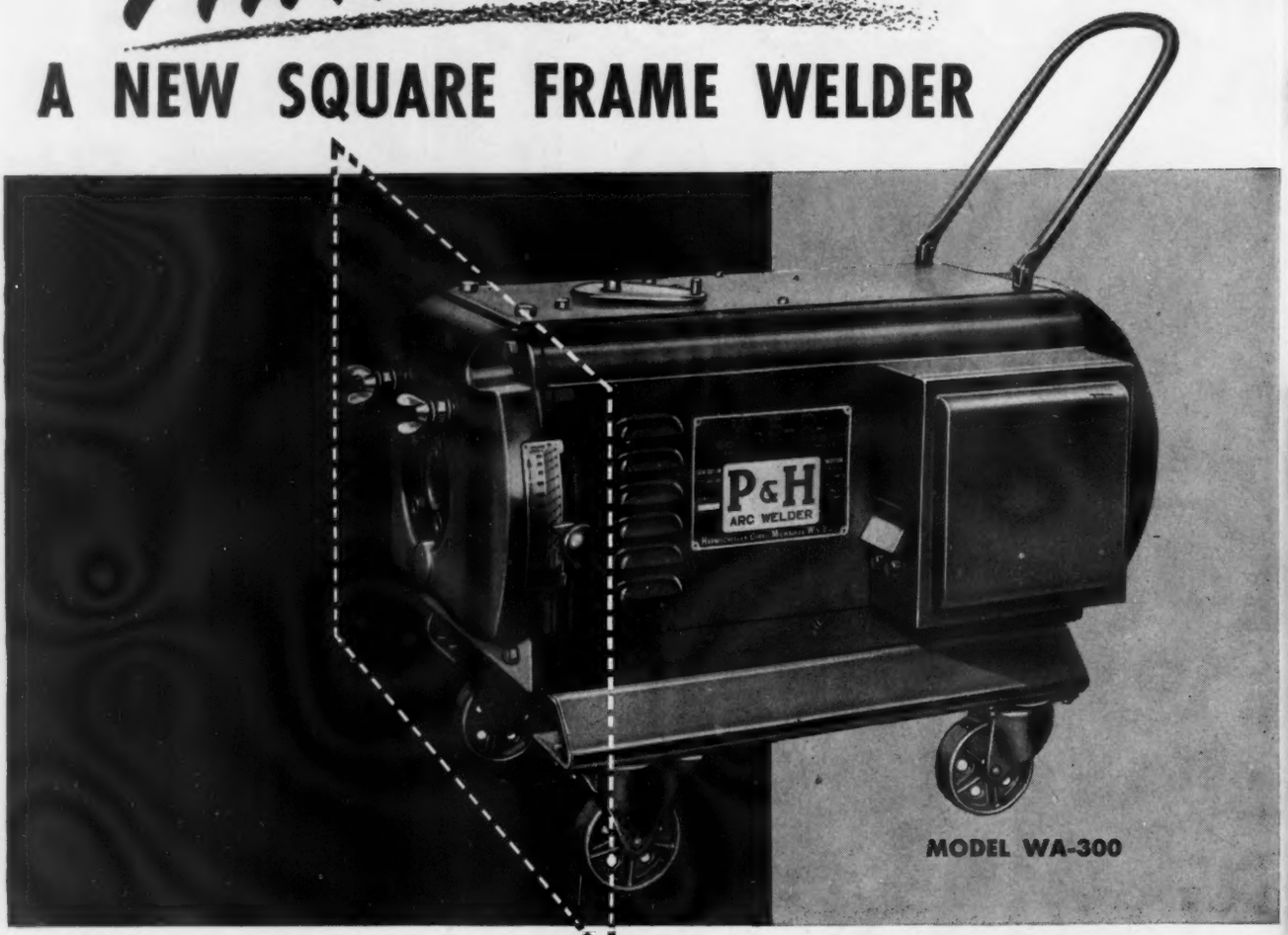

MODEL WA-300

with WSR (WELDING SERVICE RANGE) from 60 to 375 amperes

NOW—all the unique advantages of P&H's Square Frame design (and some new ones, too!) are brought to you in a welder of larger capacity.

Here are a few important operating advantages:

- SIMPLE SQUARE FRAME DESIGN — with but two major parts.
- PARALLEL OPERATION — dual mounting of machines enables you to handle higher amperage needs.
- POLARITY REVERSING SWITCH
- REMOVABLE STATOR — for easier inspection and servicing.
- CONTACT OVERLOAD PROTECTION
- MAGNETIC STARTER — with low voltage and overload protection.
- WEATHER-PROOF CONSTRUCTION

A single control provides any desired welding heat within the machine's capacity. WSR (Welding Service Range) ratings give you the actual usable welding current the machine will deliver from minimum to maximum. "Visi-matic" calibration enables you to select, instantly, the right current for each of the three classes of electrodes—high, medium, or low voltage.

If your work falls within a range of 60 to 375 amperes, it will pay you to get all the facts about this new P&H Model WA-300. Write for Bulletin No. W-59.

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There is probably no form of machining which Midvale has not had to utilize and develop in our own shops. Naturally we make many of our own tools and for each of them we have developed the right steel through long experience. In selecting Midvale tool steels, therefore, you are buying far more than so much metal. You are sharing in the laboratory research and shop experience of America's foremost custom steel maker.

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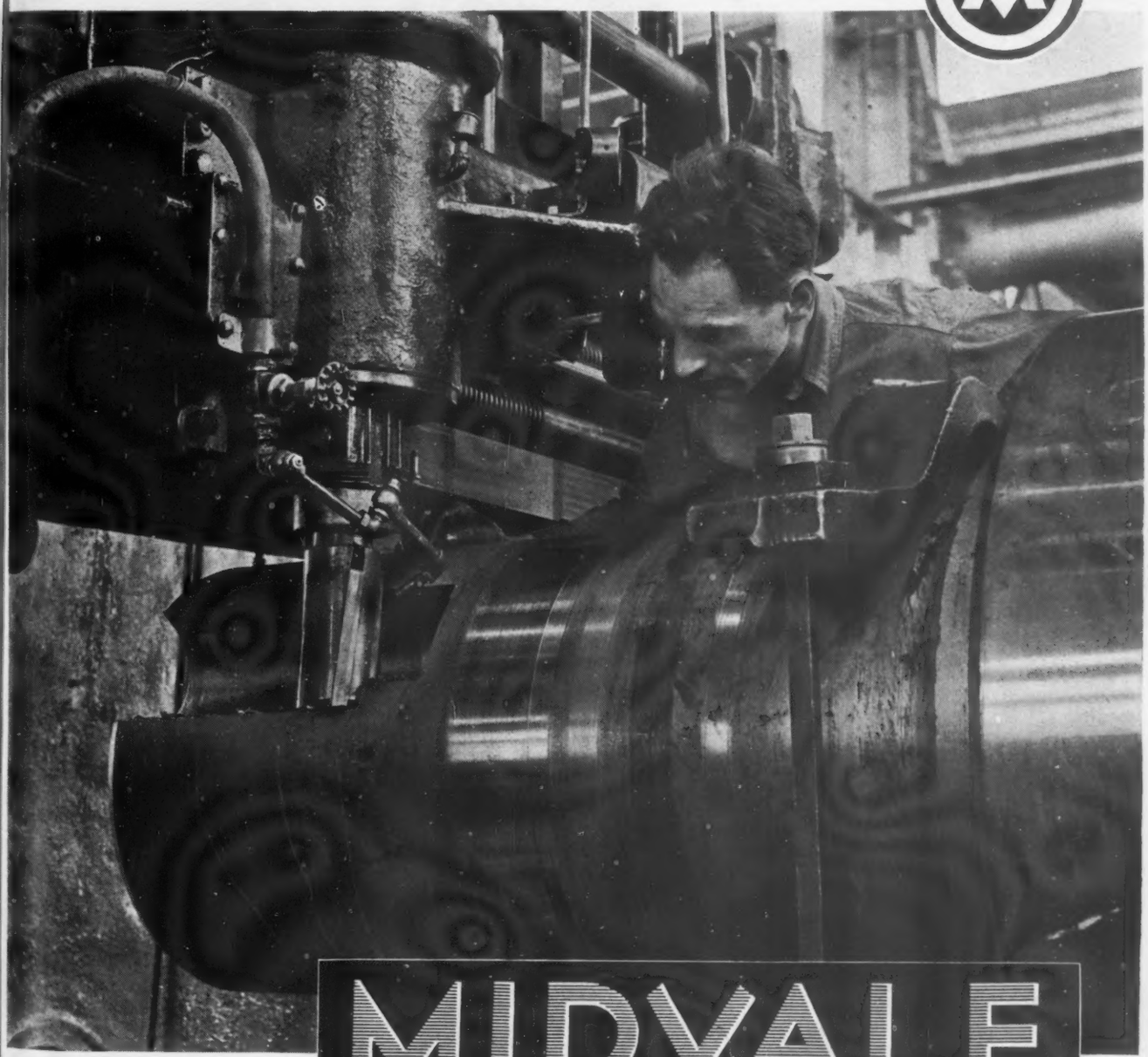

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wanta be a PROUD *papa?*

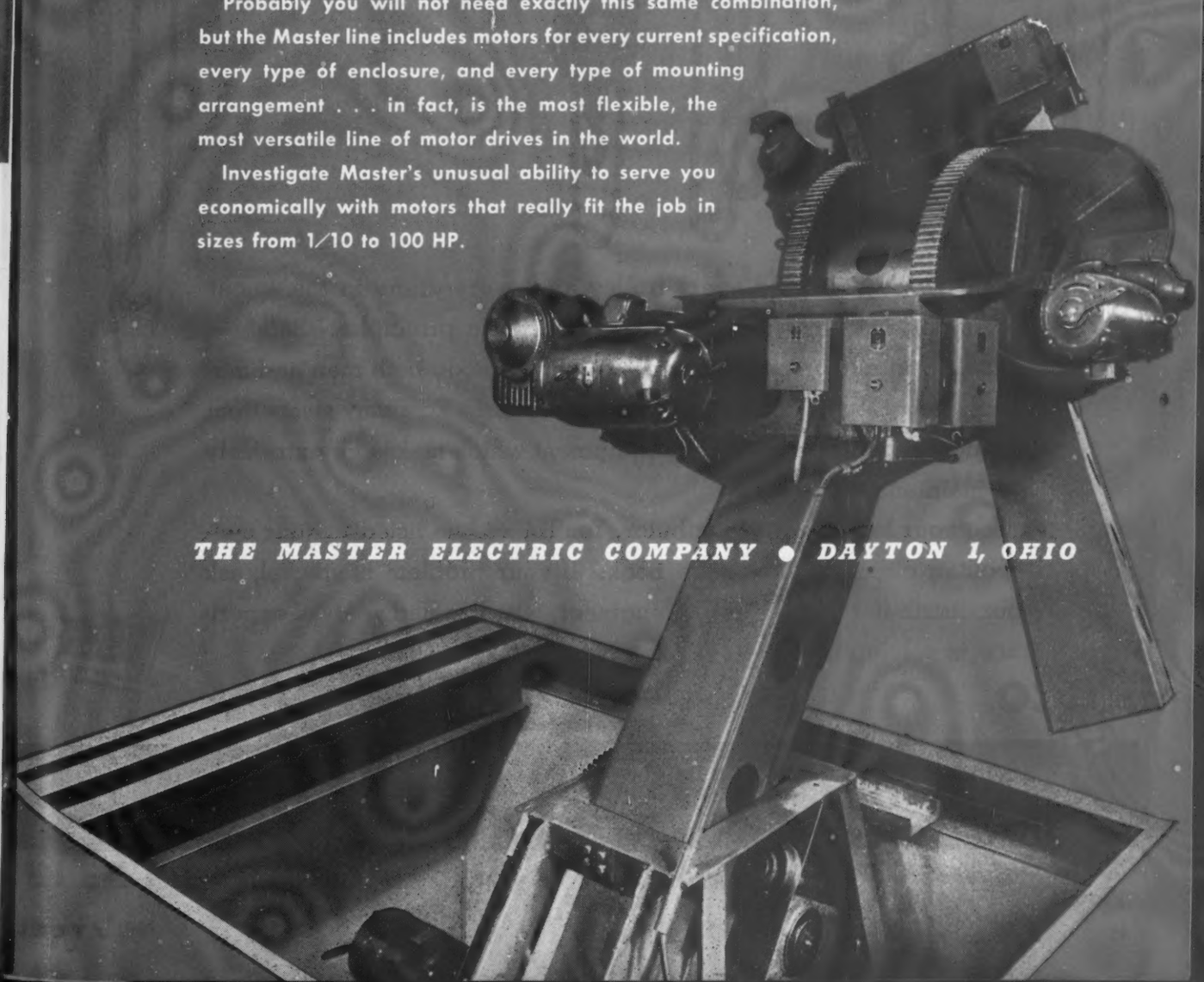
Wanta be really proud of those brain children of yours? Proud because the equipment you're designing is cleaner cut, less expensive, more compact, more flexible. Proud because you know you're able to do a better job.

Well we can help you, just as we've helped thousands of other engineers like you. Helped them do a better job because we could furnish a power drive that fit the job exactly.

For example, look at the motor drives on this welding positioner. These units incorporate a motor, a gear reduction and an electrically operated brake . . . all arranged for sidewall mounting. All of these . . . the motor, the gear reduction and the electric brake . . . all are standard Master units, that easily combine into one compact, integral, power package. Saves ordering and mounting time . . . saves space . . . saves money.

Probably you will not need exactly this same combination, but the Master line includes motors for every current specification, every type of enclosure, and every type of mounting arrangement . . . in fact, is the most flexible, the most versatile line of motor drives in the world.

Investigate Master's unusual ability to serve you economically with motors that really fit the job in sizes from 1/10 to 100 HP.



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● Every hoist and every trolley and every crane in the **WRIGHT** line is designed and built to meet three basic principles: Safety—Efficiency and Economy. Safety first, of course, to both men and machine. Efficiency of operation from first to last. Economy stems from the rugged durability of **WRIGHT** equipment which makes for extremely low maintenance costs.

See your local **WRIGHT** distributor. You'll find him listed in your metropolitan classified telephone book. If your problem is special, ask your distributor to call a **WRIGHT** engineer, who has had years of experience in solving material-handling problems.

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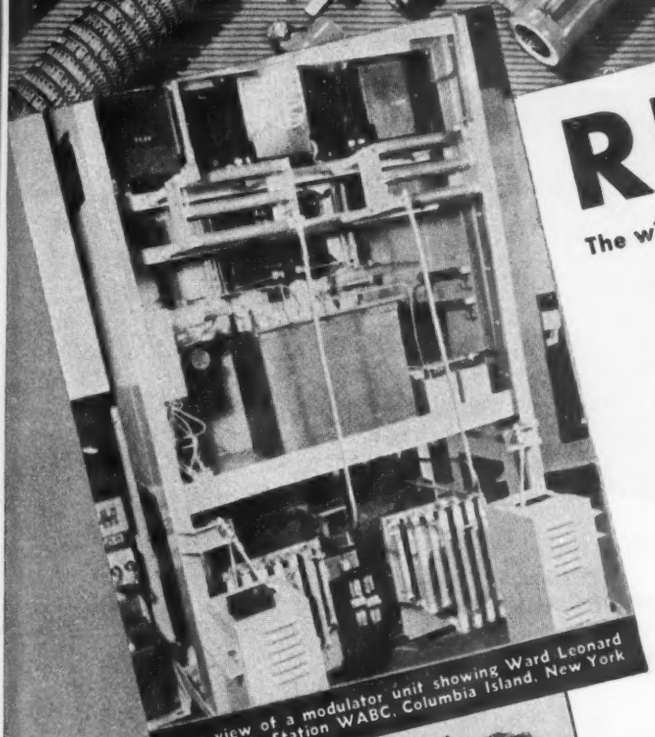
In Business for Your Safety

RESISTORS

The wire-wound resistor you need is made by Ward Leonard



Rear view of a modulator unit showing Ward Leonard Resistors in Station WABC, Columbia Island, New York

Ward Leonard resistors include a full range of types, sizes, ratings, terminals, mountings and enclosures. They are built to withstand heat, moisture, vibration and other adverse conditions.

The electrical and electronic industries depend on Ward Leonard—pioneers in the commercial production of vitreous wire-wound resistors—for resistance units to meet each new development. Ward Leonard engineers are always glad to assist in working out special applications.

RHEOSTATS AND RELAYS — Ward Leonard is headquarters for electrical controls of all kinds. A comprehensive line of rheostats and relays has been developed hand in hand with the development of vitreous wire-wound resistors.

WARD LEONARD ELECTRIC CO.
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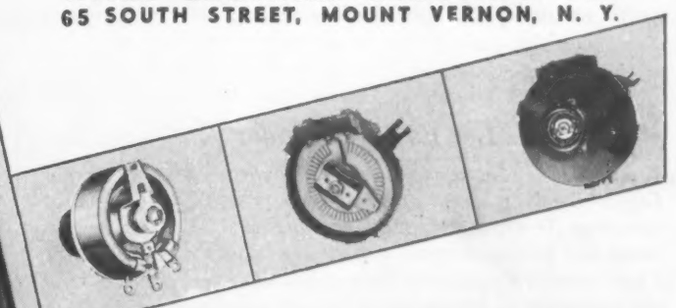

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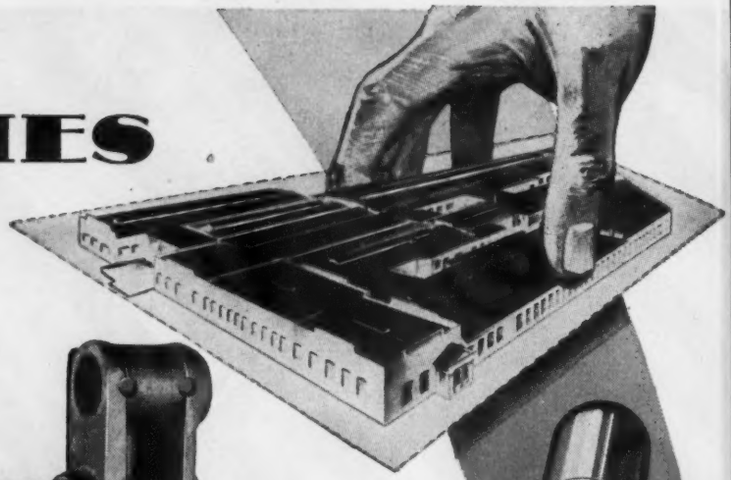

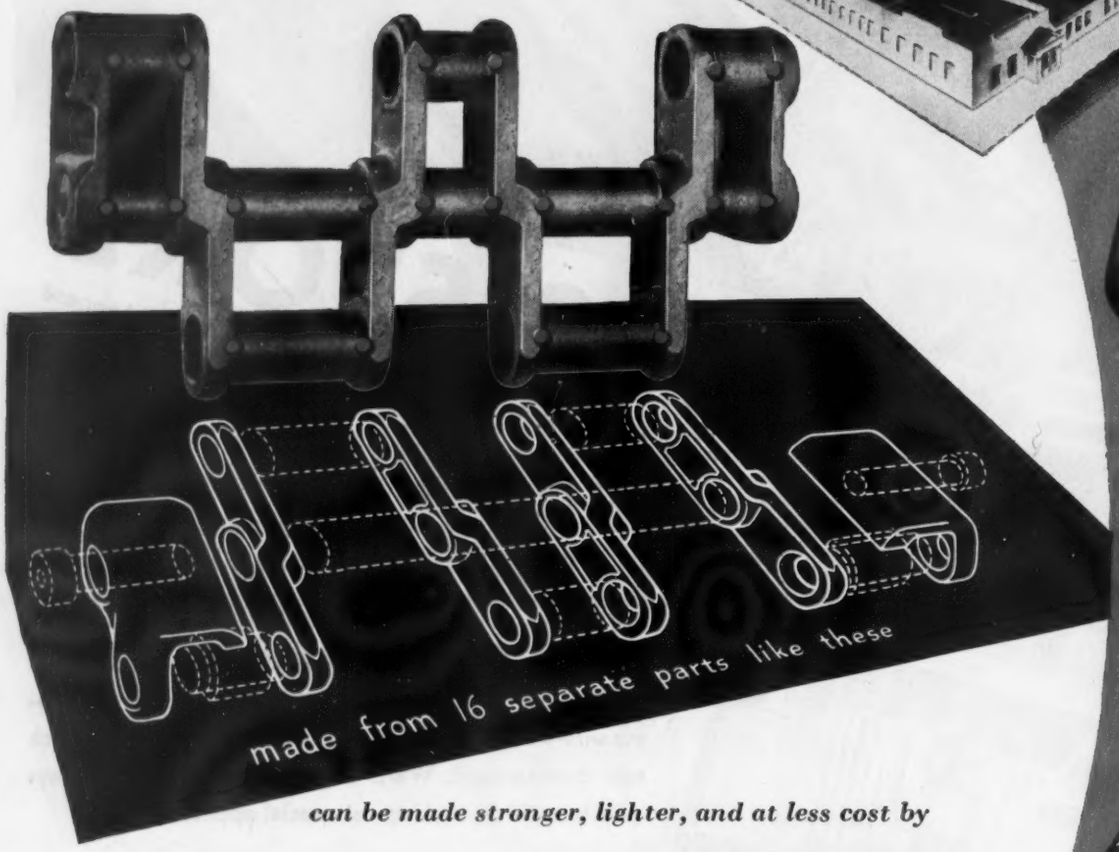

can be made stronger, lighter, and at less cost by

Hydrogen Copper BRAZING

Jobs like these Demonstrate Why Burgess-Norton belongs in your Post-War Production Picture. In this 16 part tank track link 20 joints are simultaneously brazed and in the same operation heat treated and quenched. Unlike spot welding, there is no resultant brittleness at point of weld; actually the bond is as strong as the component parts.

Let us talk it over . . .

Let us explain the many advantages of Hydrogen Copper Brazing; how it often makes possible the substitution of stampings for expensively machined forgings, how it assures precision and greater strength, reduction in weight and lower costs. These facilities are a part of Burgess-Norton's complete facilities for the production of hardened and ground screw machine products, steel stampings, piston pins and ball bearings. Write Burgess-Norton Mfg. Co., 200 Peyton Street, Geneva, Illinois.

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40 years in GENEVA, ILLINOIS

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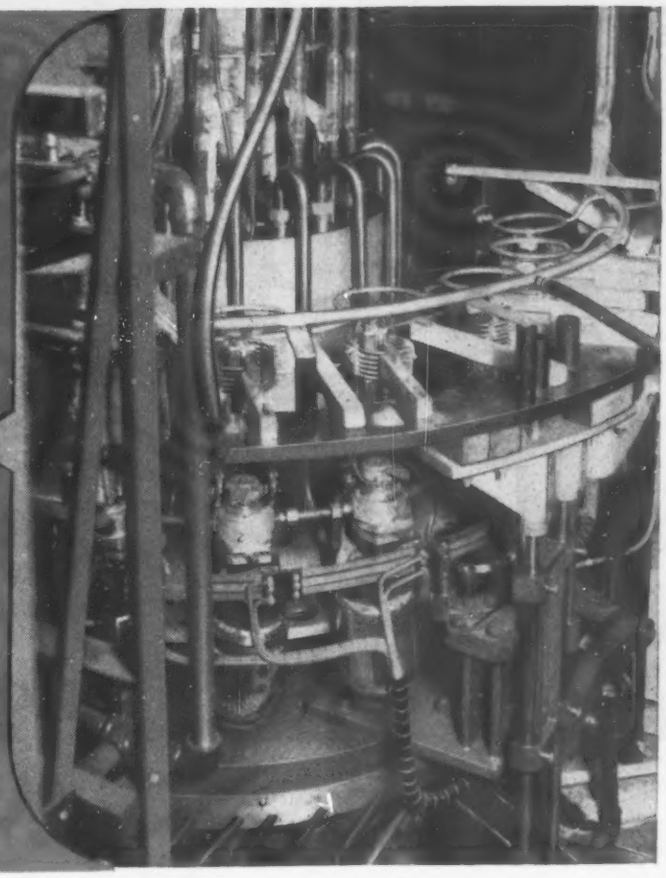
A Part is Never Made Right Unless it is Satisfactory to Our Customers

VACUUM-TUBE PRODUCTION PROBLEM *Solved by* ELECTRONIC HEATING



As long ago as 1921, G-E engineers, troubled by the problem of removing minute traces of gas from vacuum tubes during the exhausting process, found electronic heating to be the solution.

Only by applying heat to a tube's internal elements, without affecting the glass enclosure, could the residual gas be effectively expelled—yet this was the final step before sealing, and the elements were inaccessible.

The problem was solved by encircling the tube with an inductor coil connected to a high-frequency oscillator. By induction, the internal elements were heated quickly, and the last vestiges of gas removed.

One of the earliest industrial applications of electronic heating, this tube-exhausting process is now employed by G.E. to such an extent that, in one tube plant alone, more than 50 electronic heaters are used exclusively for this purpose.

If your production problems involve the heat-treating, brazing, or soldering of some hard-to-get-at part or complicated assembly—or the application of heat to a closely limited zone—you will probably find that G-E electronic heaters will do the job faster and better than your present method. For full details, simply get in touch with the nearest G-E office, or write to General Electric, Schenectady 5, N. Y.

No. 10 in a Series of Case Studies on the Accomplishments of G-E Electronic Heaters

GENERAL ELECTRIC

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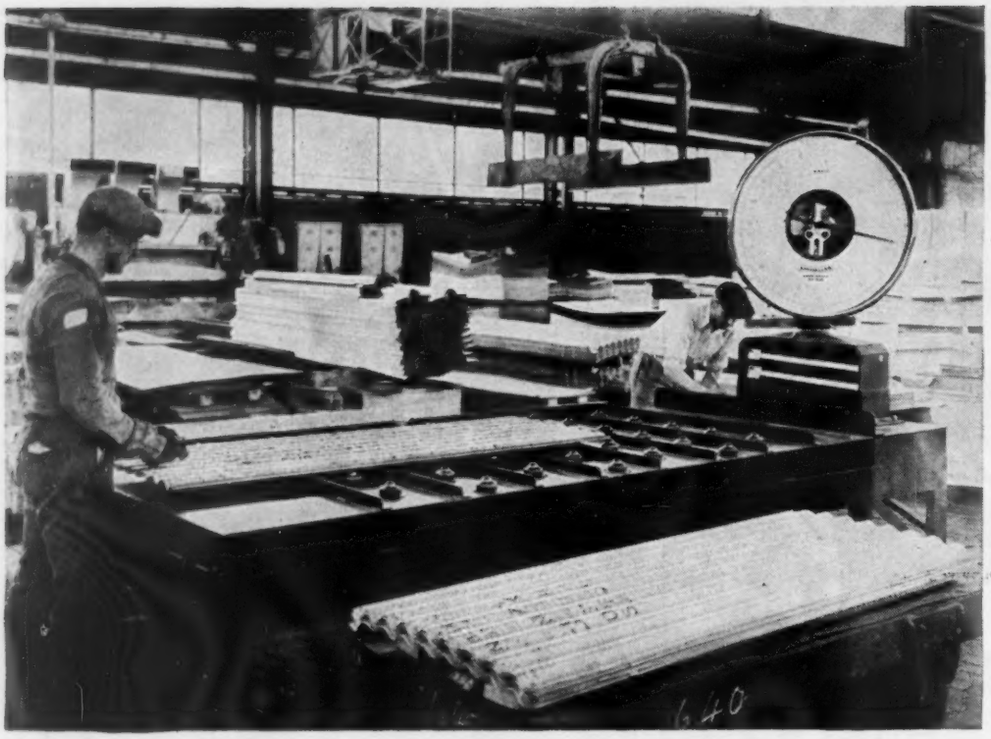
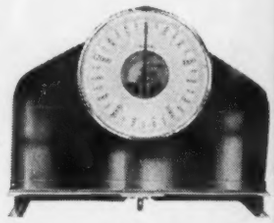
● Five and 15-kw G-E electronic heaters such as these are found in many locations throughout G-E tube plants. They are identical in size and type to many of the G-E electronic heaters so widely used in industry for other induction-heating applications.

Buy all the BONDS you can—
and keep all you buy.

ELECTRONIC HEATERS



KRON Portable Platform Scales, available in 3 or 4-wheel models with or without tare and capacity beams, maintain accuracy even under hard usage. Capacities up to 2700 lbs.



KRON Crane Scales, in standard or low headroom types, provide high capacity weighing for loads up to 60,000 lbs. at extreme accuracy indoors or out. Inbuilt features including 25% overload factor insure complete safety.

KRON Swivel Dial Head is exclusive feature of all Kron Dial Scales, assuring the operator of an unobstructed view of the dial chart at all times, eliminating point-of-view errors. Entire head rotates through a complete circle at will.

PRODUCTION *"GUESSTIMATES"* ARE FILLED WITH HIDDEN COSTS

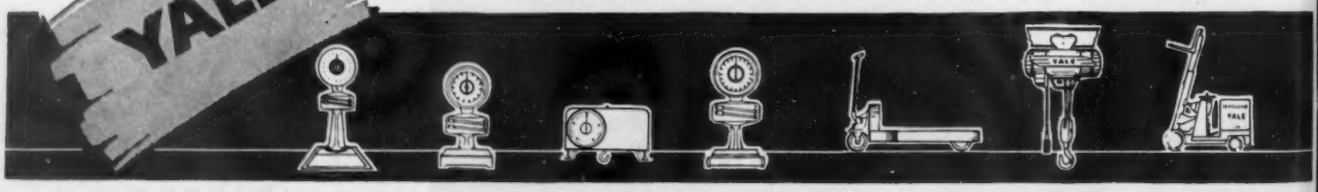
Production "guesstimates" result in the *hidden costs* industry pays for in lost time, wasted materials and mistakes in weighing, counting, measuring and batching. These materials handling operations are too often overlooked by industrialists in their constant search for more profitable methods to lower costs and speed production.

Kron Precision Springless Industrial Dial Scales are engineered specifically to keep these operations in step with modern production practices. Weighing, counting, measuring and batching are only a few of the many operations Kron Scales handle better and faster . . . at lower cost . . . with unfailing accuracy and durability, at a minimum of lost time and waste motion.

Available in dormant and portable platform, bench, overhead track, crane, pitless suspension and many other models for special purposes, Kron Scales are the answer to every problem of high-cost weighing. Write to The Yale & Towne Manufacturing Co., Philadelphia Division, 4530 Tacony Street, Philadelphia 24, Pa., for your copy of the new catalog of Kron Scales made by Yale.

KRON INDUSTRIAL SCALES

CUT HANDLING COSTS . . . SAVE TIME . . . SAVE EFFORT . . . PROMOTE SAFETY



MATERIALS HANDLING MACHINERY: TRUCKS—HAND-LIFT AND ELECTRIC • HOISTS—HAND AND ELECTRIC

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This New Catalog and Handbook

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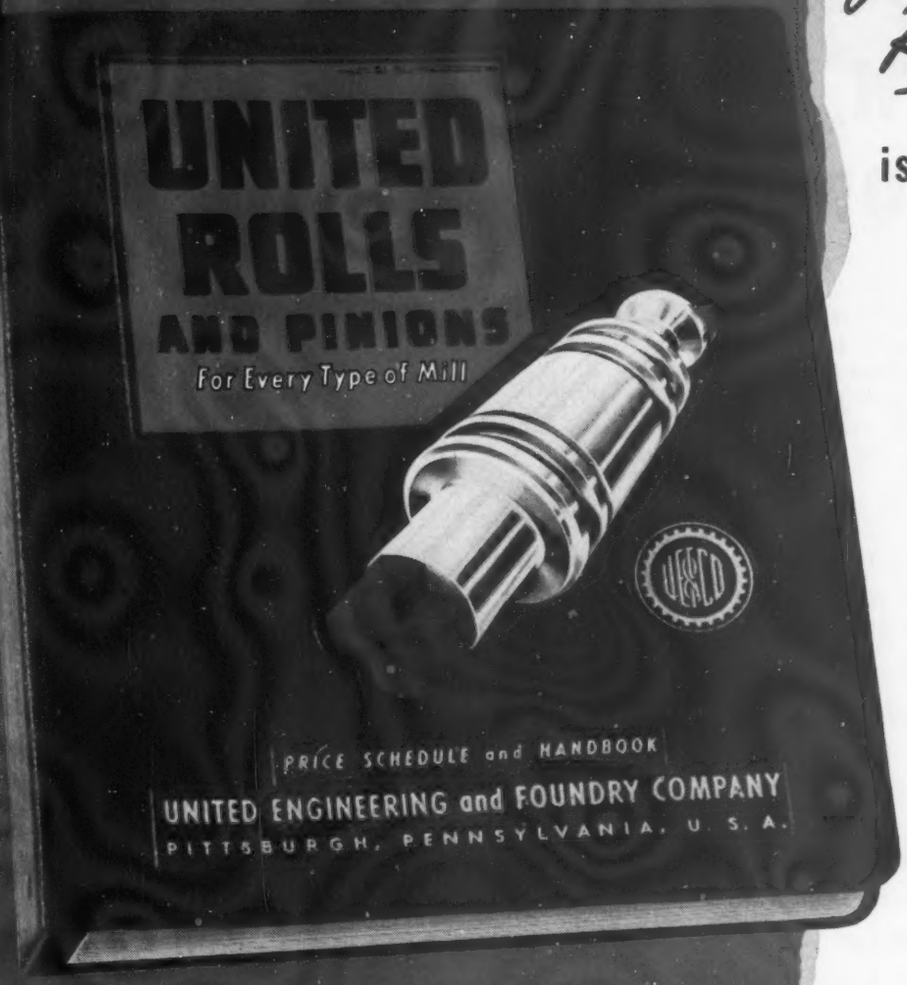

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Just off the press. It's new, authoritative, up-to-the-minute. And it's packed with authentic technical and metallurgical information for those engaged in the rolling of ferrous or non-ferrous metals or other materials. The various types of rolls most successfully used in today's modern rolling operations are fully described.

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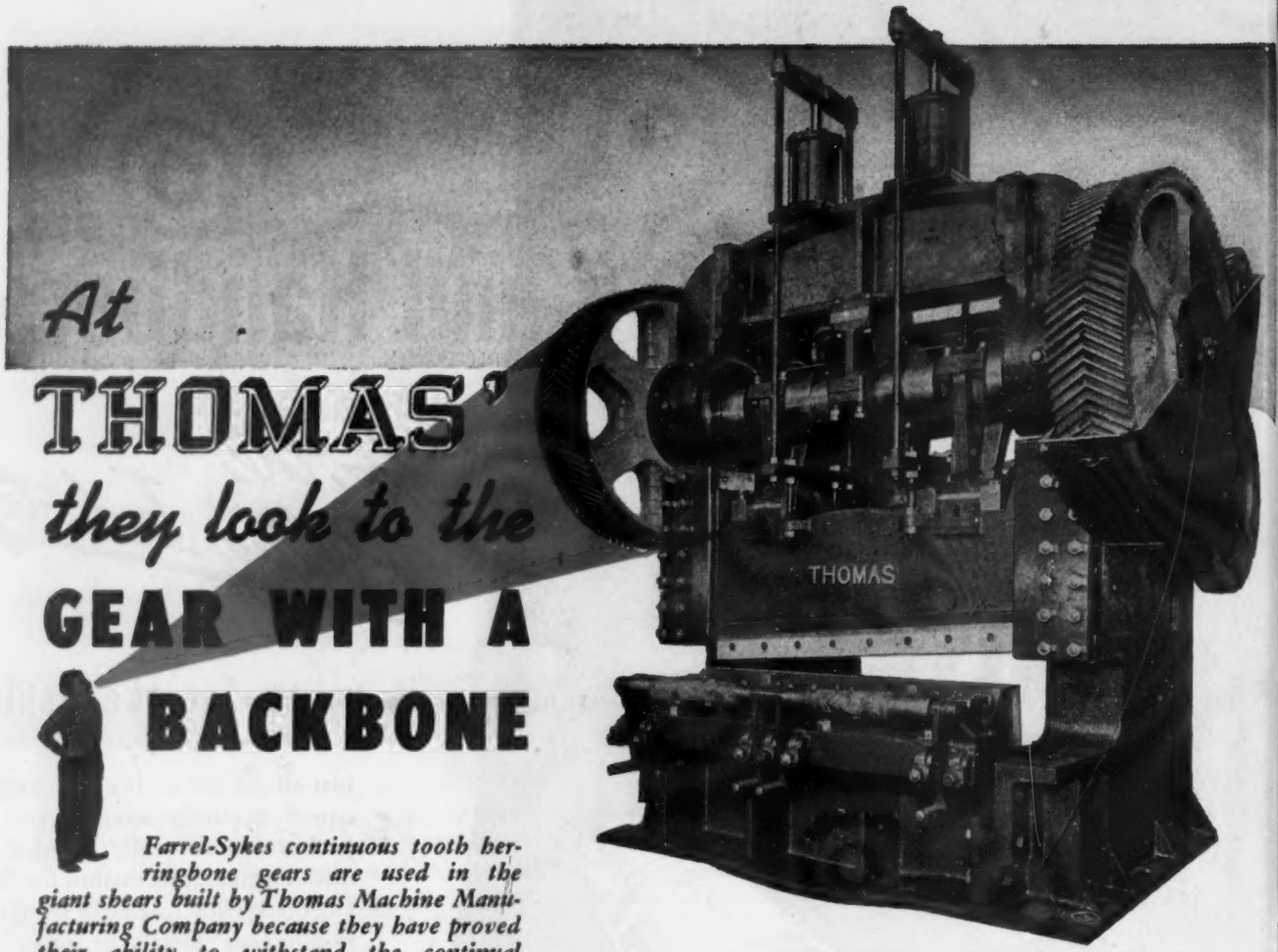

At THOMAS' they look to the GEAR WITH A BACKBONE

Farrel-Sykes continuous tooth herringbone gears are used in the giant shears built by Thomas Machine Manufacturing Company because they have proved their ability to withstand the continual shocks and stresses to which they are subject in this heavy duty service.

Because the two helices meet to form continuous teeth, the entire face width is put to work, and the ***backbone,*** which takes the place of the center groove in some gears, provides extra strength and high load-carrying capacity.

In addition, precision generation by the Farrel-Sykes process, overlap or interlacing of the teeth, gradual engagement and inclined line of pressure contribute to smooth operation and maintenance of correct tooth action throughout the life of the gears. The opposed helices balance and absorb axial thrust within the gear member, preventing harmful thrust loads with resultant stresses on other parts of the machinery.

For the complete story of the *Gear with a Backbone,* send for a copy of Catalog No. 438. Or, if you prefer, one of our engineers will be glad to discuss your gear problems with you at any time.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN., BUFFALO, N. Y.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

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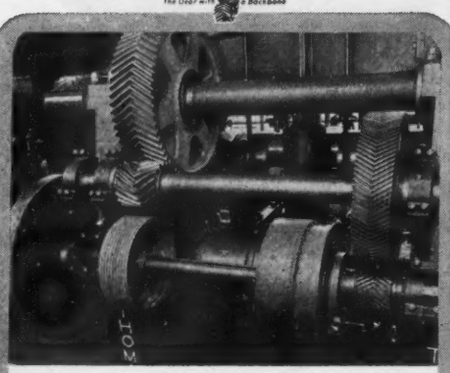
FARREL The Gear with a Backbone



This rear view of the Thomas Shear shows two pairs of Farrel-Sykes continuous tooth herringbone gears in the drive. The main gears are shown in the front view above; they are 120" diameter, 20" face. This massive shear will cut mild steel 3" thick x 120" wide.

Farrel-Birmingham

Surface Hardening at Machine Gun Speed!

with

-MEGATHERM-*

INDUCTION HEATING

Here is a history-making application of a Megatherm Induction Heating Unit.

On this typical production line setup, 75 bearing pins a minute are surface hardened. This hardening is done after finish grinding has been completed.

In one high-speed operation the pins are hardened to Rockwell C 60—above file hardness—and costly finish grinding of hardened steel is avoided because scale and distortion are eliminated.

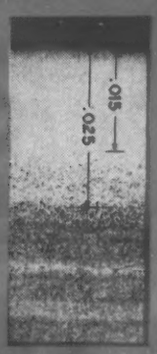
The pins are 2½" long and ½" in diameter, made of chromium molybdenum steel. To heat treat 4,500 bearing pins an hour costs approximately 50¢.

Each pin is heated above critical temperature in less than one second. Quick heating and quenching prevents scaling or distortion and gives accurate control over the hardened case depth.

This is only one of the many new applications of Megatherm Heat in the metal industry. Pieces as small as ⅛" diameter or bearing surfaces up to 6" are handled as easily, all with Megatherm.

More information on how Federal's Megatherm High Frequency Heat can save you money on your production line is yours for the asking. Check Megatherm now.

This Microphoto *magnified 100 diameters shows the hardened surface developed on bearing pins. The white portion is that of the hardened outside layer which extends to a depth of 25 thousandths of an inch. At no point in the zone between the fully hardened case and the unhardened core was there any softening or tempering.*



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Federal Telephone and Radio Corporation

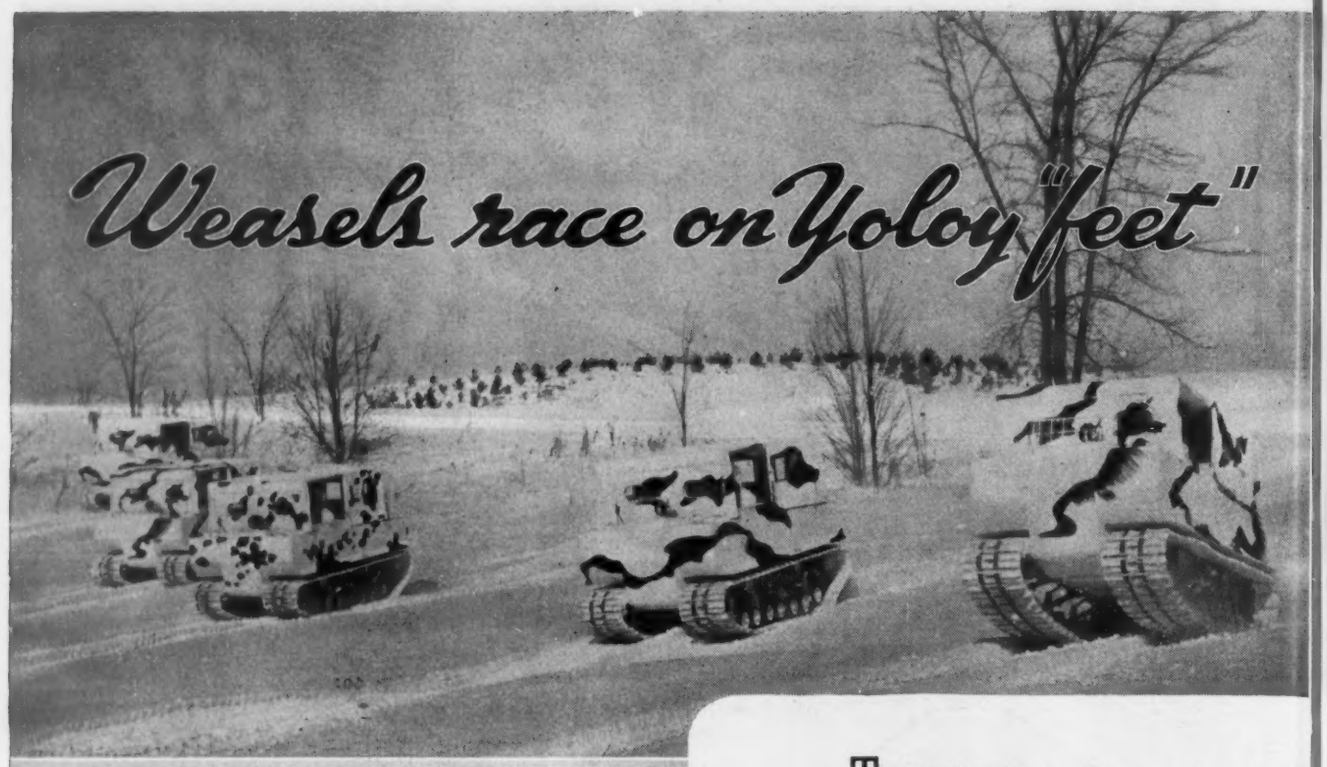
INDUSTRIAL ELECTRONICS DIVISION

AN IT&T ASSOCIATE

Newark 1, N. J.

*REG. U. S. PAT. OFFICE

Weasels race on Yoloy "feet"



The Weasel is a development by The Studebaker Corporation, whose collaboration on it with the Office of Scientific Research and Development and the Ordnance Department, Army Service Forces, goes back to May 1942.

THROUGH heavy snow, thick mud, swamp land or on improved highways, the Weasel skims over the ground with amazing speed. It is a reconnaissance car, a troop carrier, a light truck, a tow car --all in one. In secret production more than two years, hundreds of Weasels have helped confound the enemy with their swiftness and maneuverability in the Aleutians, Italy, France, the Lowlands, and Germany itself.

Secret of the Weasel's ability to perform even where most vehicles stall is the broad area of its two semi-flexible treads of Yoloy steel, running the full length of the body, and the specially engineered, independent suspension of Youngstown alloy steel springs. Clever engineering and use of Yoloy permit such unusually light-weight construction, that the pressure on the ground exerted by the Weasel is only one-fourth that of a fully equipped infantryman.

Besides Yoloy for tracks and alloy for springs, the Weasel is built with many hull and chassis stampings of Youngstown Carbon Steel. Whether you need Yoloy, the high-tensile nickel-copper alloy steel that's ideal for light-weight construction and extra-tough jobs, or alloy or carbon steel for the more conventional uses, remember that Youngstown is ready to serve you NOW - in war or in peace.

YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

YOUNGSTOWN 1, OHIO

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Carbon, Alloy and Yoloy Steels

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BETTS 20' BORING MILL IN OPERATION IN A WEST COAST WAR PLANT

BETTS 20' VERTICAL BORING AND TURNING MILL

One of the reasons behind Consolidated's enviable reputation in the heavy machine tool industry is its determination to build the greatest amount of productive value into every Consolidated machine . . . to provide a new degree of profitable operation through latest design . . . to eliminate wasted time and effort by improved operation and control . . . and increase production through Consolidated engineering skill backed by years of experience. That this policy has proved successful is evidenced by Consolidated's position in its industry.

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MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Speaking of Manpower—

men do *more work* in less time if they have a

Wells No. 8—

Today's production schedules and manpower shortage make it necessary to provide workmen with every possible means of saving time and labor . . . and that's where Wells No. 8 Metal Cutting Band Saws fit into the picture.

They can be used as auxiliary equipment to eliminate the bottleneck at big saws. They reduce time-wasting movement of stock—instead, you move a Portable Wells to the job. Set-up and change-over time are saved by their simple operation and quick acting vise. On production cut-off jobs one man can operate 2 or more Wells saws. There is a spot in *every* metal-working plant for a Wells No. 8.

SPECIFICATIONS

WELLS No. 8

CAPACITY:
Rectangular . . 8" x 16"
(Special Guides) 5" x 24"

ROUNDS: . . 8" diameter

MOTOR: ½ H.P., A.C. or D.C.

SPEEDS: . Selective 60, 90, 130 feet per minute.

WEIGHT: Approximately 750 pounds.

Wells SAWS

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
1515 FILLMORE ST., THREE RIVERS, MICHIGAN

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HOW TUBING IS MADE ?

Send for this **FLOW CHART**

Tells step by step story of the manufacturing processes of seamless copper and brass tubing. Shown here are a few of the many diagrams and illustrations; printed on heavy paper 32 x 22 inches. Write Detroit for Flow Chart 348.

TYPICAL DIAGRAMS AND ILLUSTRATIONS

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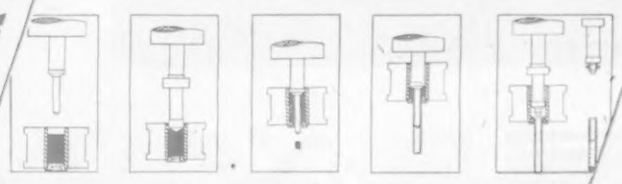
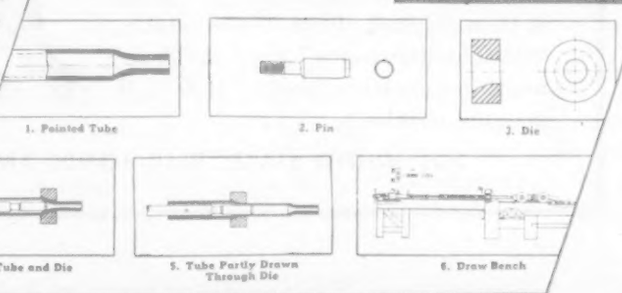
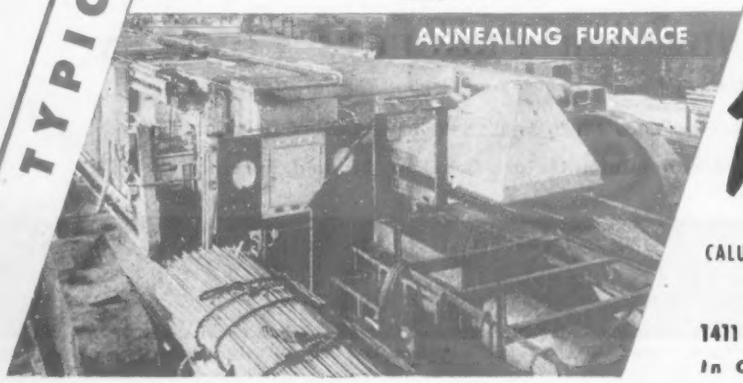


DRAWING





BUY WAR BONDS

WOLVERINE

TUBE DIVISION

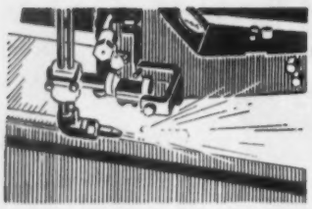
CALUMET & HECLA CONSOLIDATED COPPER COMPANY

1411 CENTRAL AVENUE • DETROIT 9, MICHIGAN

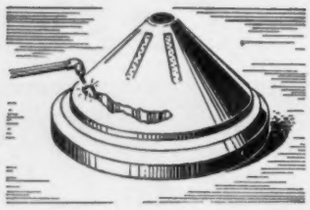
In Canada: UNIFIN TUBE CO., LONDON, ONT.

Shaped-to-Fit by FLAME-GOUGING

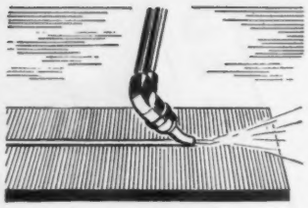
Many parts can be made out of stock steel by oxy-acetylene flame-gouging. This shaft end is being grooved to fit a clutch. Each splineway, 3 in. wide and 12 in. long, is finished in 8 minutes.



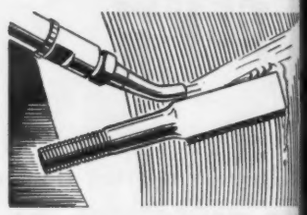
Flame-gouging takes the place of machining in preparing plate edges for welding.



. . . is the fastest way to prepare cracks in steel castings for reclamation by welding.



. . . is a quick and economical way to make oil grooves in steel plate.



. . . replaces grinding and chipping in the removal of temporary welds.

Flame-Gouging: Is quick... easy... quiet... and economical

If you have an OXWELD cutting blowpipe, all you need is an OXWELD gouging nozzle

There are only three sizes. They differ in the width and depth of gouge which they will make in one pass. The determining factor is the diameter of the cutting orifice — 1/8 in., 3/16 in., 1/4 inch. Write for the catalog, "Oxweld Blowpipes," Form 4488, for more information about OXWELD gouging nozzles.

BUY UNITED STATES WAR BONDS AND STAMPS

MARITIME "M" AWARD FOR OUTSTANDING PRODUCTION ACHIEVEMENT

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 E. 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities

In Canada: Dominion Oxygen Company, Limited, Toronto

LINDE OXYGEN . . . PREST-O-LITE ACETYLENE . . . UNION CARBIDE
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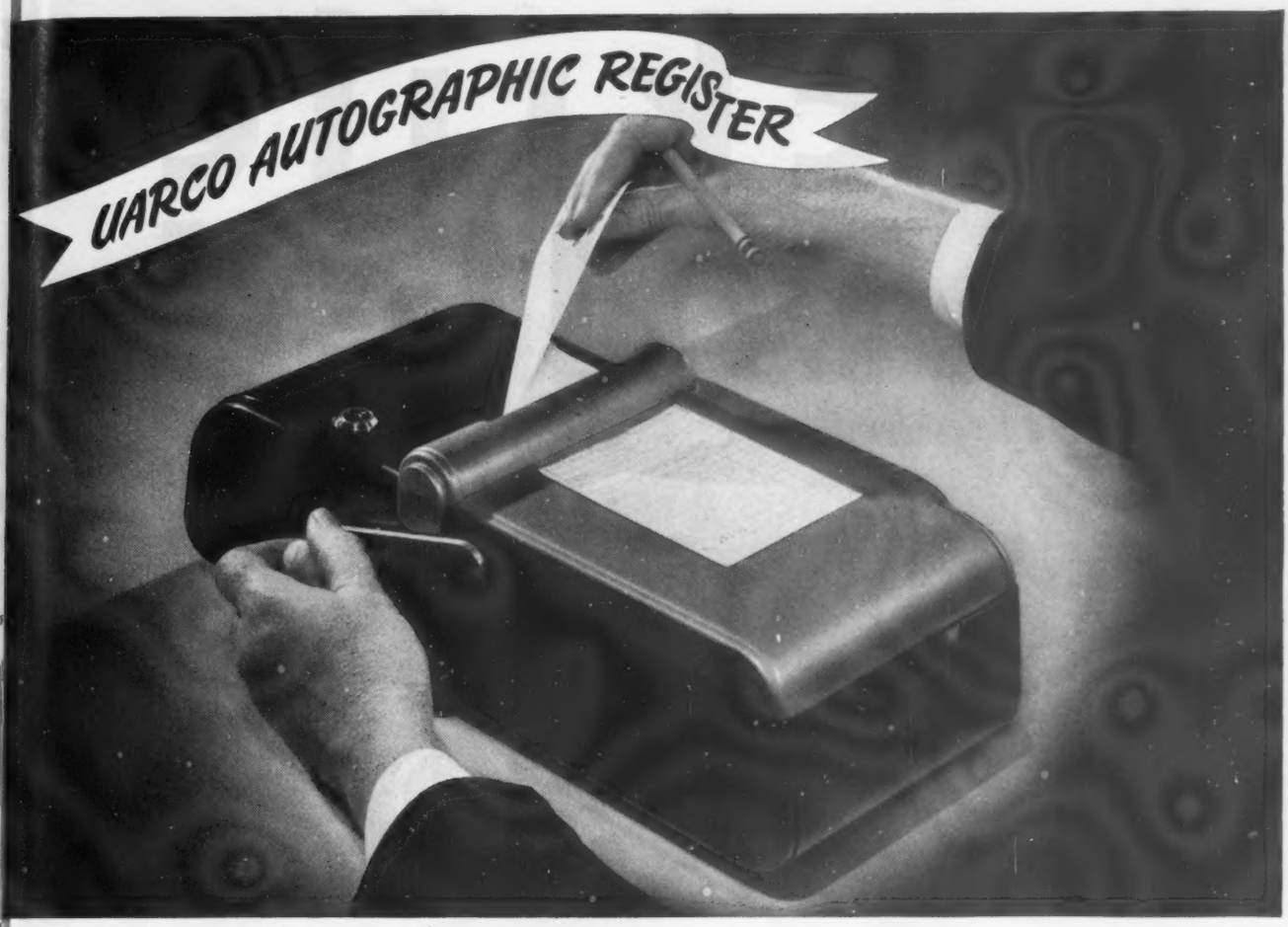
The words "Linde," "Oxweld," "Prest-O-Lite," "Prest-O-Weld," "Purox," "Union," and "Unionmelt" are trade-marks of Union Carbide and Carbon Corporation or its Units.



To MAKE Business records . . . that BREAK Production records

Today modern record keeping plays a vital role in the breaking of production records. And Uarco Autographic Registers hold a key position in keeping record writing at top efficiency. For these Registers offer greater speed, fewer errors and more convenience in keeping records from buying to billing.

Why? Because with Uarco the forms are loaded in the Register ready for writing. Write the record—turn a crank—and out pop the needed forms . . . eliminating carbon fuss and other getting-ready-to-write operations. At one writing one person can produce an original plus many legible copies.

A firm writing base . . . plus ever-fresh carbon paper always in place in every Uarco Register assures legibility . . . legibility that means fewer errors, less confusion all along the record route. The forms used in these Registers are designed to fit individual needs . . . forms come consecutively numbered for easy filing and finding. A duplicate copy of every record written may be automatically filed for protection.

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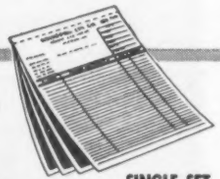
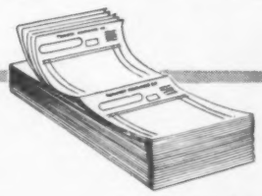
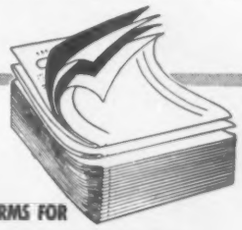
AUTOGRAPHIC REGISTERS


SINGLE SET FORMS




CONTINUOUS-STRIP FORMS FOR HANDWRITTEN • TYPEWRITTEN • BUSINESS MACHINE RECORDS

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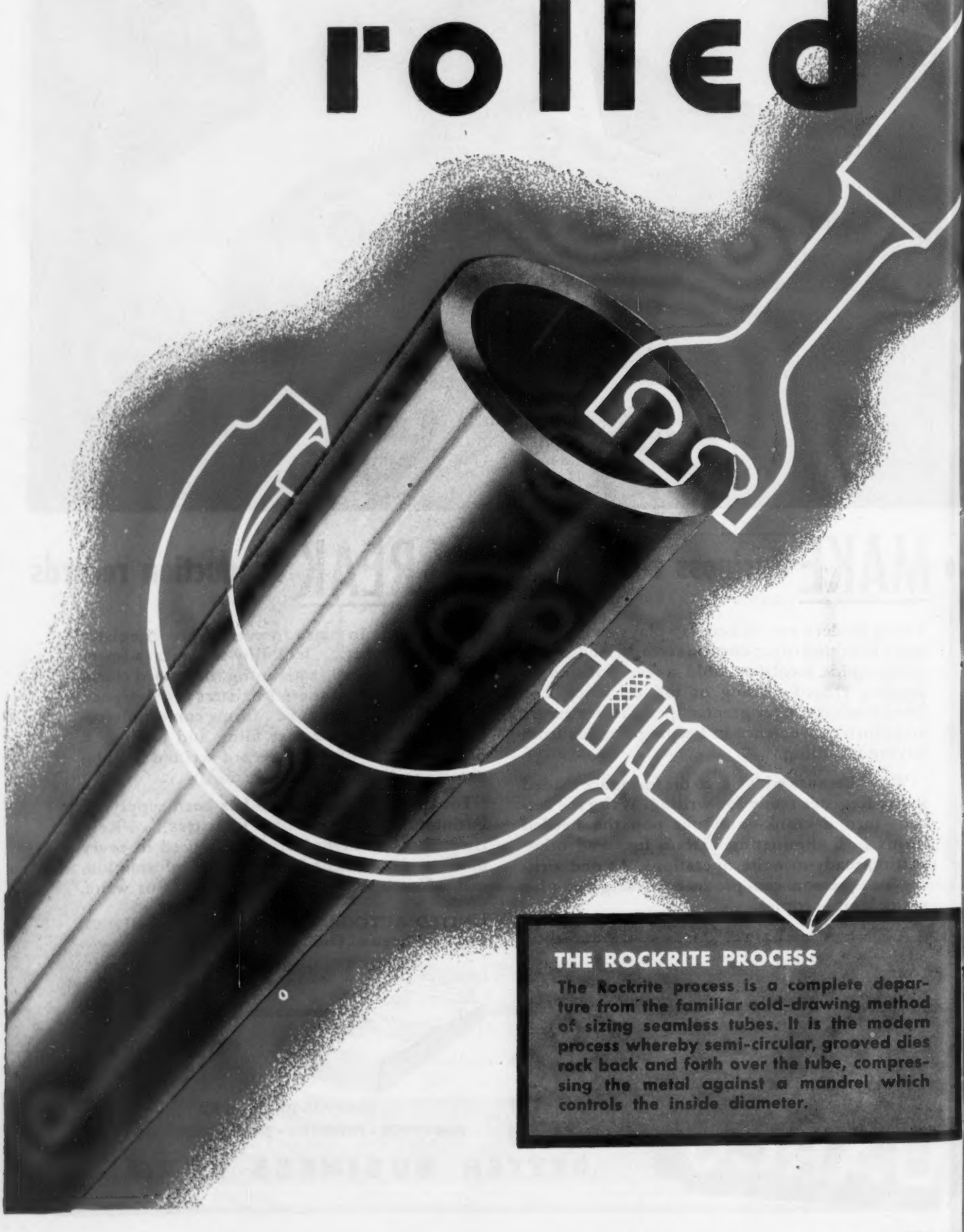
BETTER BUSINESS FORMS

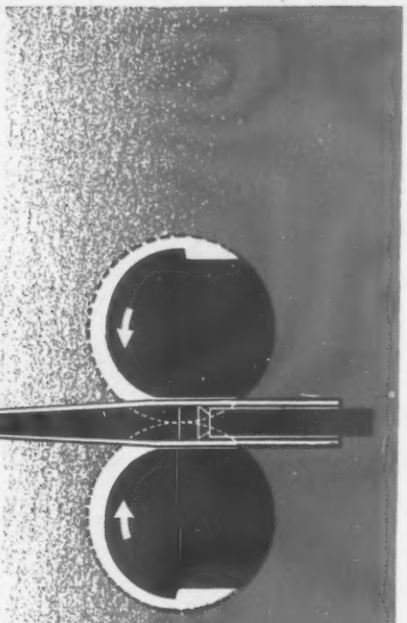
Rockrite rolled



THE ROCKRITE PROCESS

The Rockrite process is a complete departure from the familiar cold-drawing method of sizing seamless tubes. It is the modern process whereby semi-circular, grooved dies rock back and forth over the tube, compressing the metal against a mandrel which controls the inside diameter.

to close tolerances



with these Production Boosting Money Saving Results

Ring-shaped or cylindrical parts can be machined from Rockrite tubing faster and at lower cost than is possible with ordinary tubing or bar stock, because —

Fast reaming or broaching replaces slow drilling or time-wasting boring of inside surfaces.

Production of finished parts by automatic screw-machines is usually increased subtantially, by avoiding the bottleneck of delayed operations.

High cutting speeds—100 to 117 surface feet per minute—are easily realized without shortening tool life.

One-operation forming-tool finishing of outside surfaces is frequently possible.

In some cases no machining is necessary on outside or inside surface.

These savings are possible because Rockrite tubing is sized to closer tolerances. It is more concentric, has less ovality. Wall tolerances are half —or less than half—those of conventional cold-sized tubing. Therefore Rockrite tubing can be machined with light cuts of uniform depth, at high speeds.

Many alert manufacturers will use Rockrite tubing to combat rising costs of post-war products—to give users of these products better values.

Inquiries from designers of post-war products will be held in strict confidence.

TUBE REDUCING CORPORATION

WALLINGTON
NEW JERSEY

PUT MACHINES BACK IN ACTION *quicker*—

by cleaning them

The JENNY Steam-Spray Way—

8 to 10 times faster than hand methods

Every hour saved in putting production machinery or fighting equipment back into action, means speeding the hour of Victory. That is why hundreds of manufacturers of war material speed repairs of vital machinery by steam cleaning *first* with Hypressure Jenny. That is why, too, Uncle Sam saves precious hours and manpower by using Hypressure Jenny to clean tanks, guns, planes, trucks, jeeps and other fighting equipment 8 to 10 times faster than by hand methods.

Hypressure Jenny steam cleaning before repairs saves the 25% to 40% of mechanics' time which actual time studies show is lost in wiping grease and dirt from machinery, parts, tools, and equipment. And Jenny's highly atomized mixture of steam, hot water, and cleaning compound sprayed under pressure, so completely removes grease and dirt that cracks or defects are often revealed for repair before actual breakdowns occur.

Jenny can help *you* cut "down time" and put *your* machines back in action quicker. Write for complete information.

HYPRESSURE JENNY

Cleans

- Machinery
- Diesel Engines
- Electric Motors
- Floors
- Walls
- Windows
- Buildings
- Skylights
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- Bulldozers
- Hoists
- Booms
- Refrigerator Cars
- Lavatories, etc., etc.

"M" Pennant with three additional gold stars—Maritime highest production award to men and women making valves for the Victory Fleet.

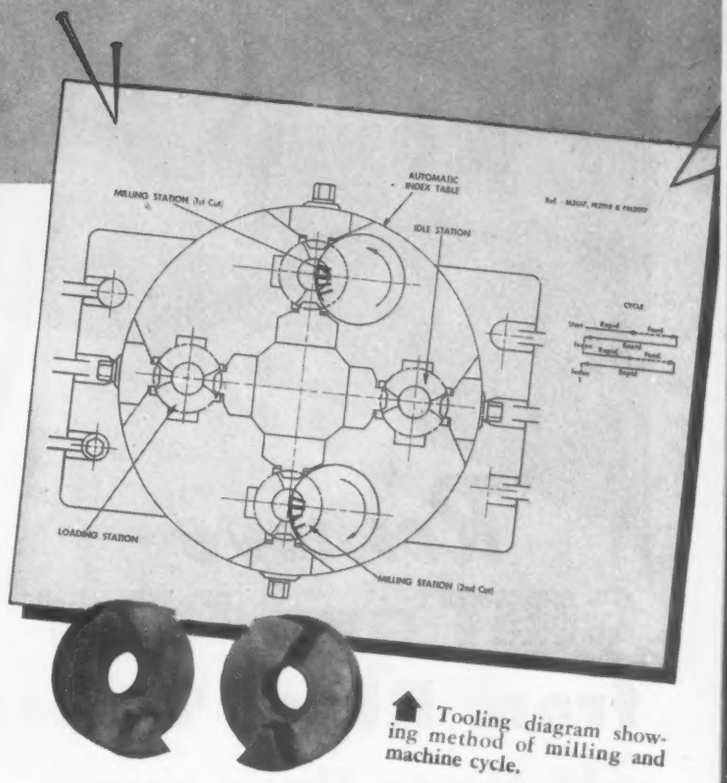
HYPRESSURE JENNY DIVISION OF

HOMESTEAD VALVE MFG. CO.

P. O. BOX NO. 22 CORAOPOLIS, PA.

A "STRICTLY SPECIAL" MILLING JOB

. . . . HANDLED ON MODIFIED STANDARD SUNDSTRAND RIGIDMIL



Tooling diagram showing method of milling and machine cycle.

Designed to accommodate a wide variety of special heads and tooling Sundstrand *Standard* Rigidmils are often used to solve special milling production problems.

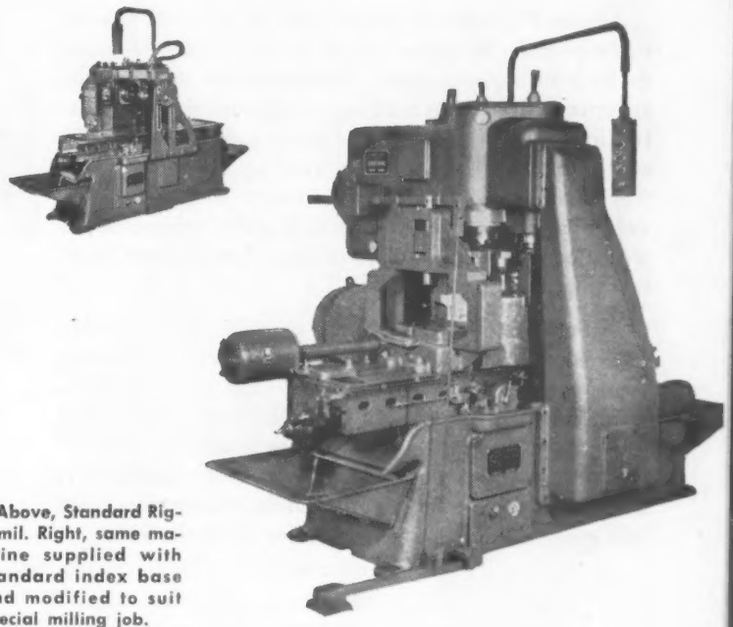
Here's how the Houde Engineering Corporation uses a Sundstrand Fluid Screw Rigidmil on a special milling problem. The shock absorber abutment flange requires milling at high production and to close limits. The Standard Rigidmil has been provided with a special head having two vertical spindles and a special outboard brace. A standard Sundstrand automatic index base with four special work holding fixtures is mounted on the machine table. Operations consist of milling in stations No. 2 and No. 4, see operation drawing.

PRODUCTION INCREASED 40%

In addition to increasing ease of operation and accuracy, production has been increased 40% over the former method. The foot operated lever roughly positions the part prior to clamping—dial indicators facilitate speedy, accurate setting of the cutters.

DIMENSIONS HELD TO .0002" CONSISTENTLY

Application of the standard Sundstrand Automatic Index Base eliminates the need for re-locating the work between operations. Consequently both sides of the flange are held absolutely flat, parallel with each other and within a relative height of .0002".



•Above, Standard Rigidmil. Right, same machine supplied with standard index base and modified to suit special milling job.

HOW SUNDSTRAND ENGINEERED PRODUCTION WILL GIVE YOU ECONOMICAL MILLING

In addition to having designed a wide range of Standard Rigidmils which are easily rearranged to accommodate special milling jobs, our engineers have designed countless special machines for all types of production milling jobs. Call on them without obligation. Write for these descriptive machine bulletins today. Ask for bulletin 734.

ARMY-NAVY "E"

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

SUNDSTRAND MACHINE TOOL COMPANY

2540 Eleventh St. • Rockford, Ill., U. S. A.

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT • DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

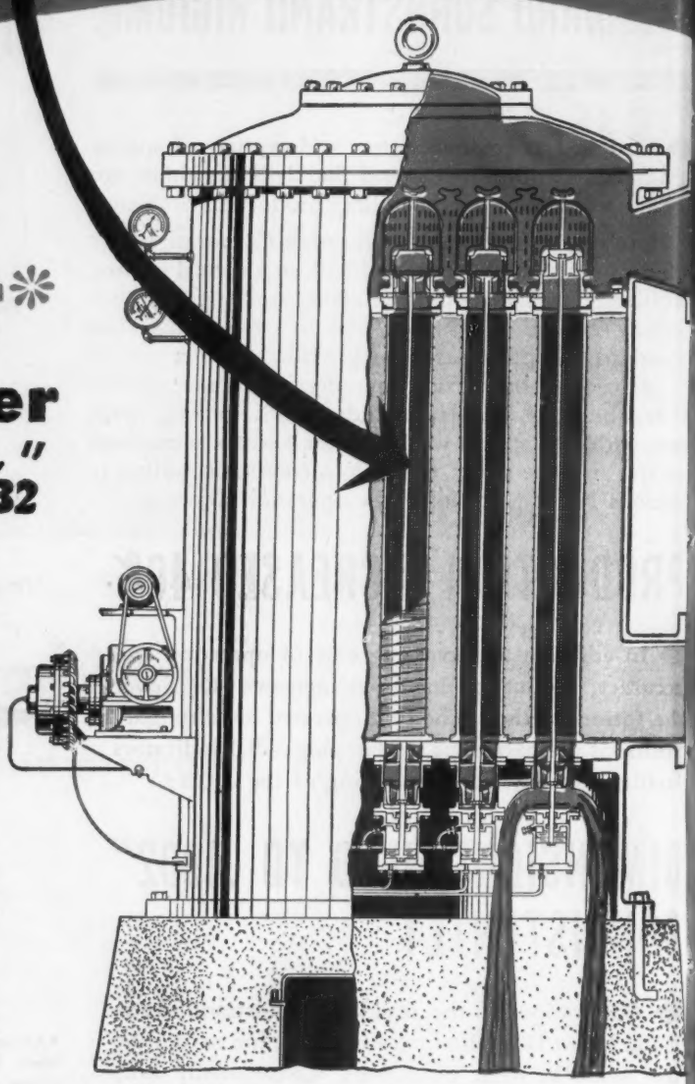
ADAMS AUTOMATIC WATER FILTERS

Remove GRIT and DIRT* from River Water

*15 times finer than 1/32"

Adams *Poro-Screen* Filters offer a practical answer to large-scale filtration of dirty river water for use in hydraulic equipment. Designed for continuous, automatic operation and requiring a minimum of attention, Adams Automatic Filters supply the required volume of clean water for your operations—water free of dirt and grit which damage bearings, rolls, valves and other equipment. Highly successful on water cooling installations of open-hearth and heat-treating furnaces.

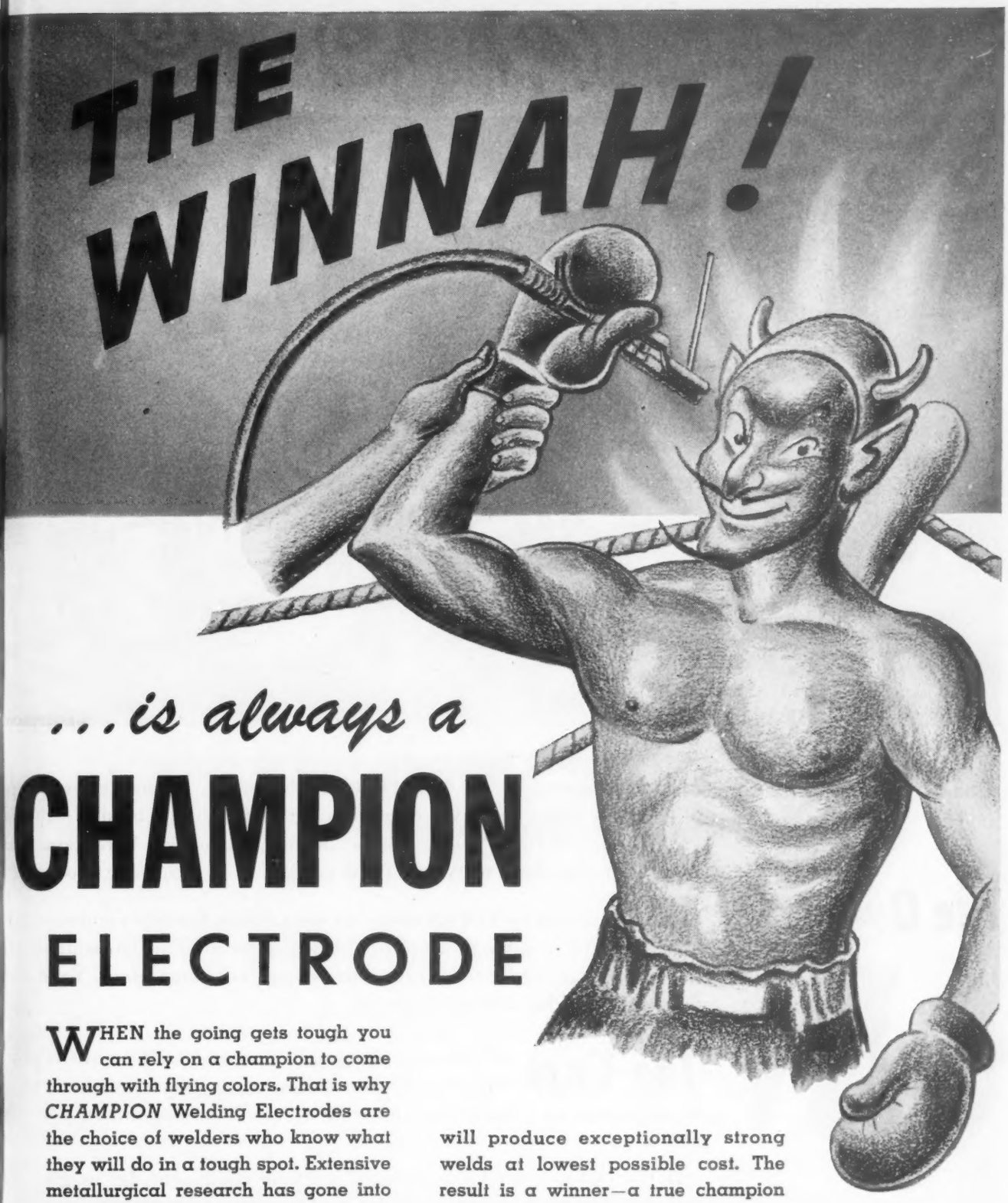
Adams Automatic Filters provide low velocity filtration. Their multiple tube design has no moving clearances, is fully automatic. One tube is back washed at a time while filter is delivering full rated capacity. Adjustable control gives flexibility of back-washing—excessively dirty water more frequently, normal water less frequently. Built in four sizes from 300 gpm. to 2000 gpm. Write for Bulletin 901.



★ R. P. ADAMS COMPANY, INC. ★

75 CHICAGO STREET, BUFFALO, N. Y.

ADAMS PORO-STONE AND PORO SCREEN FILTERS



. . . is always a

CHAMPION ELECTRODE

WHEN the going gets tough you can rely on a champion to come through with flying colors. That is why *CHAMPION* Welding Electrodes are the choice of welders who know what they will do in a tough spot. Extensive metallurgical research has gone into perfecting a line of electrodes which will produce exceptionally strong welds at lowest possible cost. The result is a winner—a true champion both in name and performance.

THE CHAMPION RIVET CO.

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High Production Pipe Mills by YODER

The Quantity of pipe produced by the YODER 6″ cold-forming, resistance weld pipe mill shown above is measured in miles per shift, without hardship on the crew. Other YODER mills, proportionately productive, have capacities from 24 inches down to ½ inch (pipe gauges) or ¼ inch (tube gauges).

The Quality... of pipe, produced on YODER mills, it's workability, flexibility and strength are illustrated in some measure by the pieces pictured at left, which have been hydrostatically tested, flanged, telescoped and compressed. Your own tests would further prove this quality.

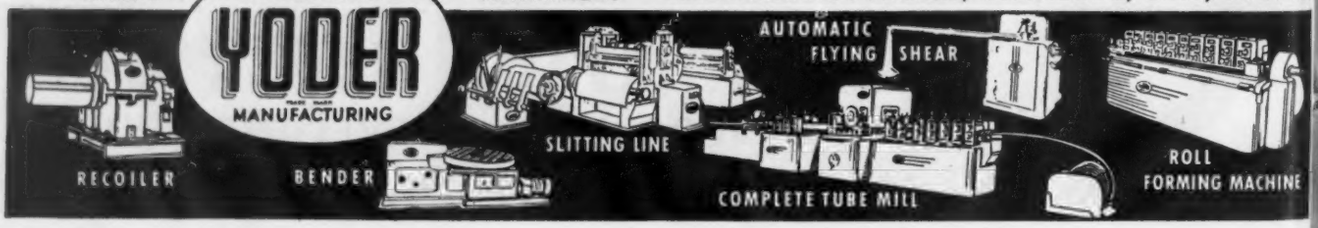
The Cost of tube and pipe production on YODER mills is probably low. Quality produced in quantity without waste of man-hours on "down time" naturally results in minimum cost per saleable unit.

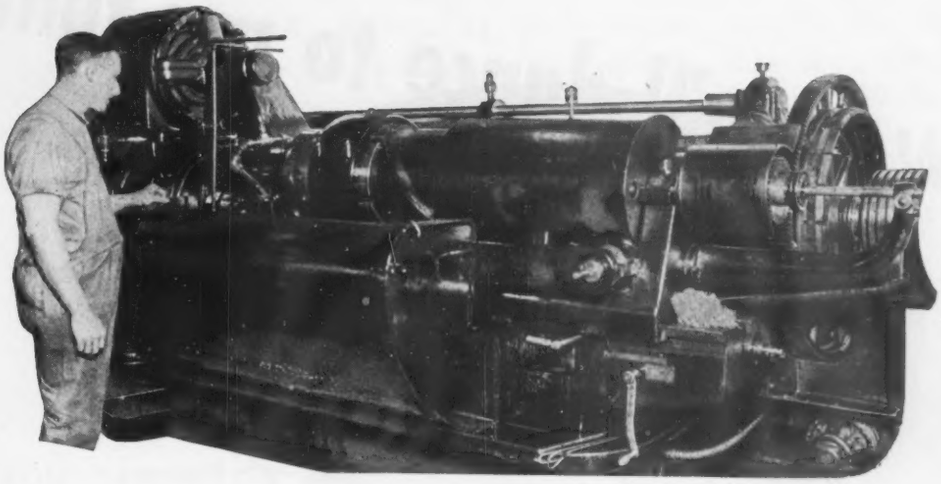
YODER makes many kinds of metal working equipment. Let us give you full particulars.

METAL • WORKING • PRODUCTION • MACHINERY

ENGINEERING YODER MANUFACTURING

THE YODER COMPANY
5502 Walworth Avenue, Cleveland 2, Ohio, U. S. A.





You Be The Sole Judge Of Our Claim . . . "PERFECTED LUBEWELL" CUTTING COMPOUND WILL INCREASE THE PRODUCTION SPEED OF ANY MACHINE TOOL UP TO 25% REGARDLESS OF THE TYPE OF WORK BEING PRODUCED

Place an order for any quantity of Perfected Lubewell . . . It will 1. Increase tool life up to 50% 2. Increase production speed up to 25% 3. Hold to closer tolerances and give superior finish 4. Lower cutting costs as much as 40% . . . If, in your estimation, these results are not obtained after a fair trial, you may tear up the bill. From eight spindle automatic screw machine work to simple drill press operations, Perfected Lubewell is outperforming from coast to coast. One order will prove our statement.

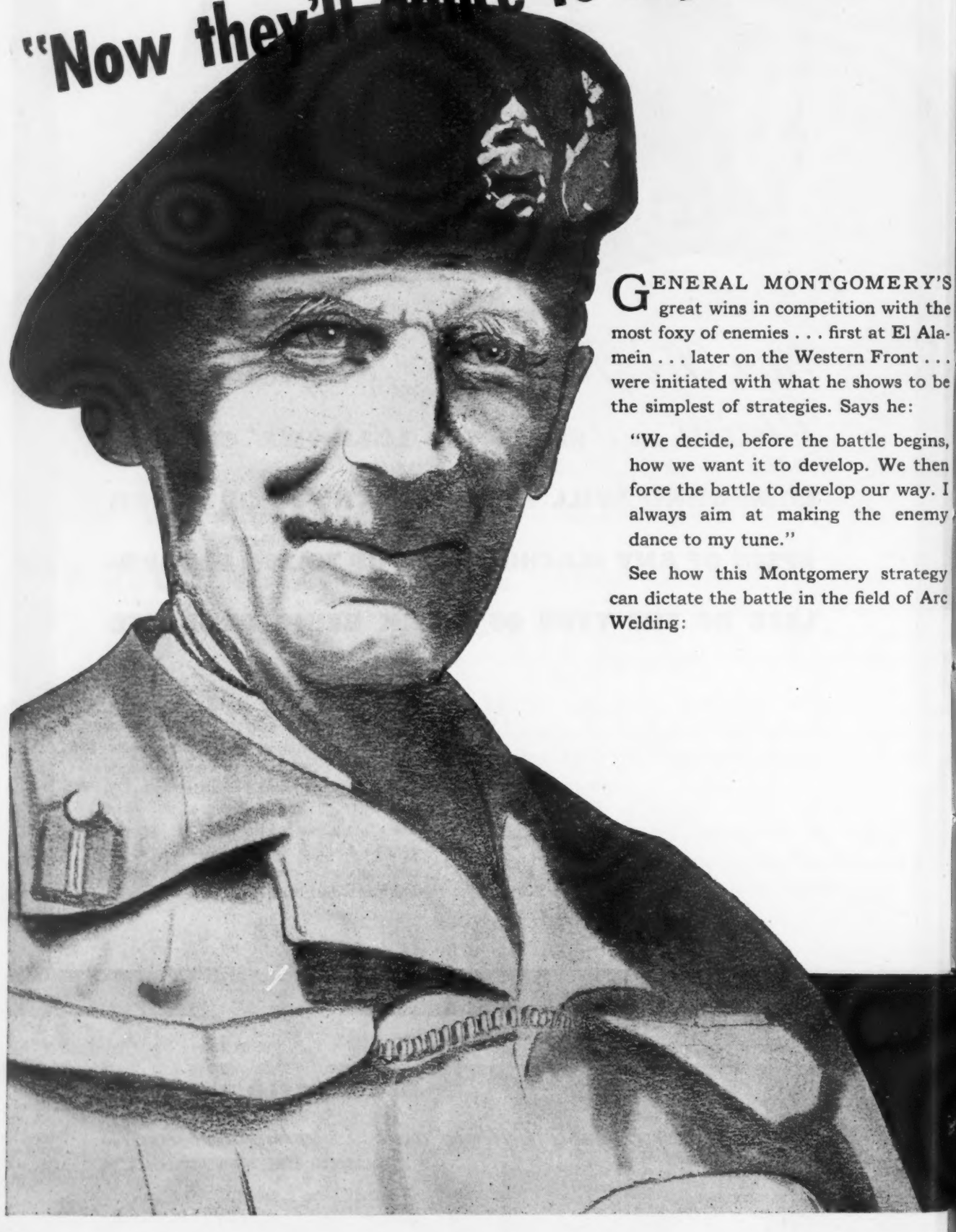
G. WHITFIELD RICHARDS

PIONEERS OF *Water Soluble Cutting and Drawing Lubricants*

1738 CARLTON STREET PHILADELPHIA 3, PA.

then he said to himself

"Now they'll dance to my tune"



GENERAL MONTGOMERY'S great wins in competition with the most foxy of enemies . . . first at El Alamein . . . later on the Western Front . . . were initiated with what he shows to be the simplest of strategies. Says he:

> "We decide, before the battle begins, how we want it to develop. We then force the battle to develop our way. I always aim at making the enemy dance to my tune."

See how this Montgomery strategy can dictate the battle in the field of Arc Welding:

"Force the Battle," *he says*

LOOK, GENERAL, how manufacturers can force the battle continuously *for better and better products at lower and lower cost* by recourse to Arc Welding:

QUALITY OFFENSIVE. Conversion of the frame of a pressing machine from the design shown at the left to welded steel (right) won these objectives: improved appearance; 16% saving in user's floor area; greater rigidity for 40% faster operation; unbreakable construction. Improvements in the welded design are readily and quickly made for greater saleability.

COST OFFENSIVE. In addition to the major saving due to the changeover of the machine design, continuous cost reductions are possible with welding production . . . through improvements in fit-up, use of work handling fixtures such as shown, use of new welding techniques and use of larger electrodes for faster welding.

Ask a Lincoln Engineer to help map your strategy for faster war production and lower postwar costs with Arc Welding.

THE LINCOLN ELECTRIC COMPANY • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

YOU'LL HAVE TO WATCH YOUR PENNIES...

IN THE PEACETIME COMPETITION

With the coming of peace and a return to the American way of producing goods at a profit in highly competitive consumer markets you'll *have* to be certain that every step from initial blueprint and tool design, through the machining, stamping and assembly line, up to packaging and delivery is planned and executed with utmost efficiency and with the minimum of cost.

In the production of war munitions Oiljak has maintained an enviable record of production of intricate parts and on time deliveries, in accordance with strict Government inspection—and has actually reduced the estimated and approved cost, thus saving the Government considerable sums, by skillful planning and supervision of the work. These same skills in metal manufacturing, improving designs and reducing costs are available to manufacturers as they convert to peacetime merchandise. It may transmit your penny savings into dollar profits to confer with us on any metal manufacturing problem.

MACHINING · STAMPING · WELDING · PLATING · FINISHING · ASSEMBLING

METAL MANUFACTURERS

THE OILJAK MANUFACTURING Co., INC.

MONTCLAIR, NEW JERSEY

THE JOB COMPLETE FROM BLUEPRINT TO FINISHED PRODUCT

ESTABLISHED!!

The VINCO Master Inspection Dividing Head is now universally accepted as the most accurate final inspection instrument yet devised for checking the angular spacing of splines, gear teeth, master index plates, graduations, cams, etc. It is approximately seven years since the VINCO Dividing Head was introduced and today it is as well known in Russia, Australia and other countries as it is in the United States. We are naturally proud of this instrument, not only for its extreme accuracy (TWO SECONDS OF ARC OR TWO PARTS IN 1,296,000) but because it has been such an important factor in increasing the production of those vital parts, involving angular spacing, that are so essential in modern war materiel. We will welcome your request for more detailed information.

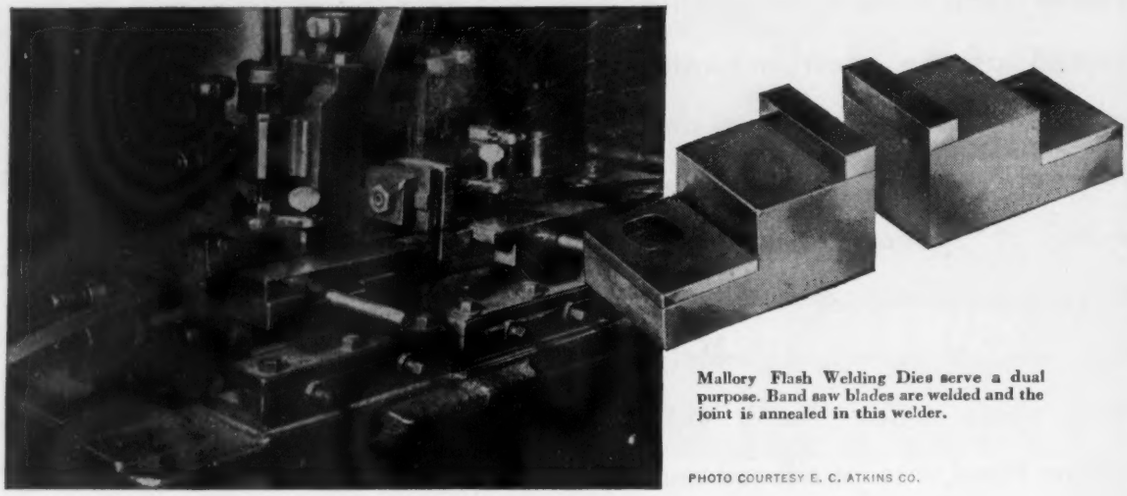
VINCO CORPORATION, 8863 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN, SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND,

MILLIONTHS OF AN INCH FOR SALE BY VINCO

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

DOUBLE DUTY!

Flash Welding and Annealing in One Operation



Mallory Flash Welding Dies serve a dual purpose. Band saw blades are welded and the joint is annealed in this welder.

PHOTO COURTESY E. C. ATKINS CO.

WHEN the ends of a band saw are welded to make it endless, conventional flash welding is not adequate. The high carbon steel of the welded joint cools too rapidly from its flash temperature . . . becomes brittle and unserviceable.

This problem is surprisingly easy to solve. A second pulse of current is passed through the welded joint. This reheats the weld area to annealing temperature and restores the steel's ductility.

Mallory Flash Welding Dies are used in this dual welding-annealing operation that makes band saws endless. Combining excellent electrical conductivity with hardness, toughness and wear resistance, these Mallory dies are good for many thousands of sound welds . . . with minimum down time for dressing.

Mallory metallurgists and welding engineers have developed *special electrode* materials . . . Elkaloy A*, Elkonite*, Mallory 3* Metal and other alloys for Mallory spot welding tips and holders, seam welding wheels, and dies for flash, butt and projection welding. Consult Mallory for the resistance welding electrodes you need.

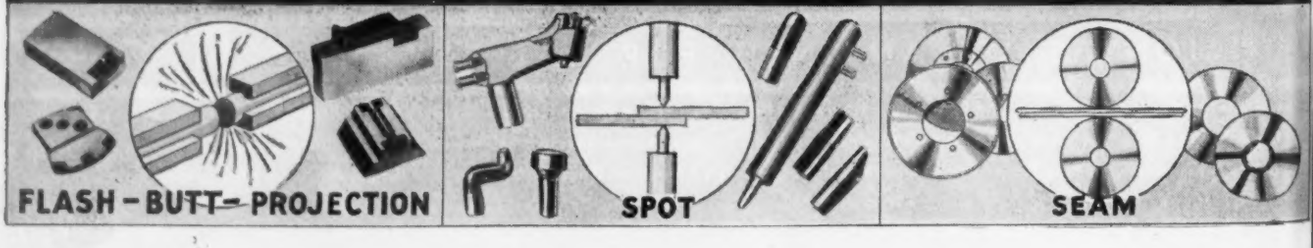
Write us today if you don't have the latest Mallory electrode catalog and the new Mallory Resistance Welding Data Book. Free to users of resistance welding, when requested on company letterhead. Price to students, libraries and educational institutions: $2.50 per copy, postpaid. Board covers, 8½" x 11", 160 pages.

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

*Reg. U. S. Pat. Off.

P. R. MALLORY & CO. Inc

MALLORY Standard Resistance Welding Electrodes



AND POSTWAR DESIGNS...

Manufacturers, to succeed in the postwar machinery and metal appliance markets, will have to establish high quality standards and at the same time keep production costs at the very minimum. Adequate bearing protection is essential in all high quality mechanical products. When this is achieved through the use of "Perfect" Oil Seals, the second requirement is also satisfied—low cost production. "Perfect" Oil Seals retain the vital lubricant in bearings and at the same time exclude the bearings' worst enemies, grit and moisture. "Perfect" Oil Seals are inexpensive and easy to apply. Consult Chicago Rawhide engineers on your postwar designs NOW.

66 years manufacturing quality mechanical leather goods exclusively and now Sirvene Synthetic Products

CHICAGO RAWHIDE MANUFACTURING COMPANY

1308 ELSTON AVENUE • CHICAGO, ILLINOIS

Philadelphia • Cleveland • New York • Detroit • Boston • Pittsburgh • Cincinnati

If You Want to SELL MORE

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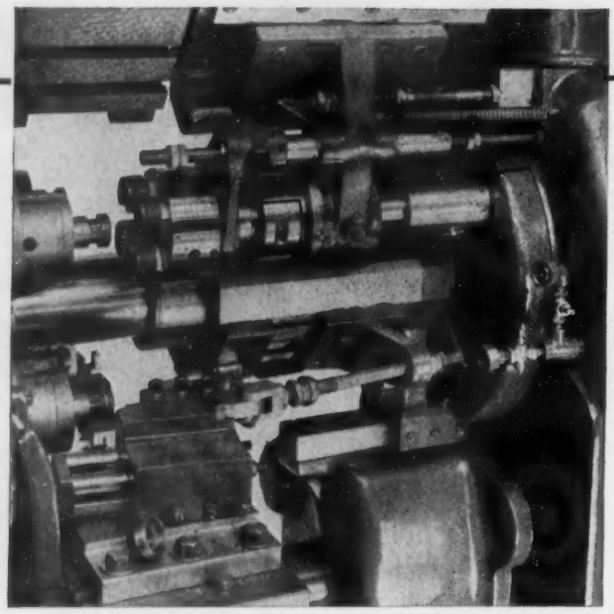

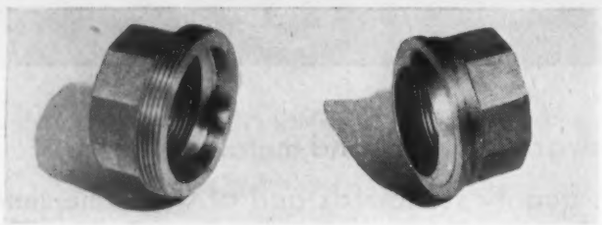

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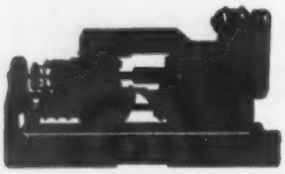

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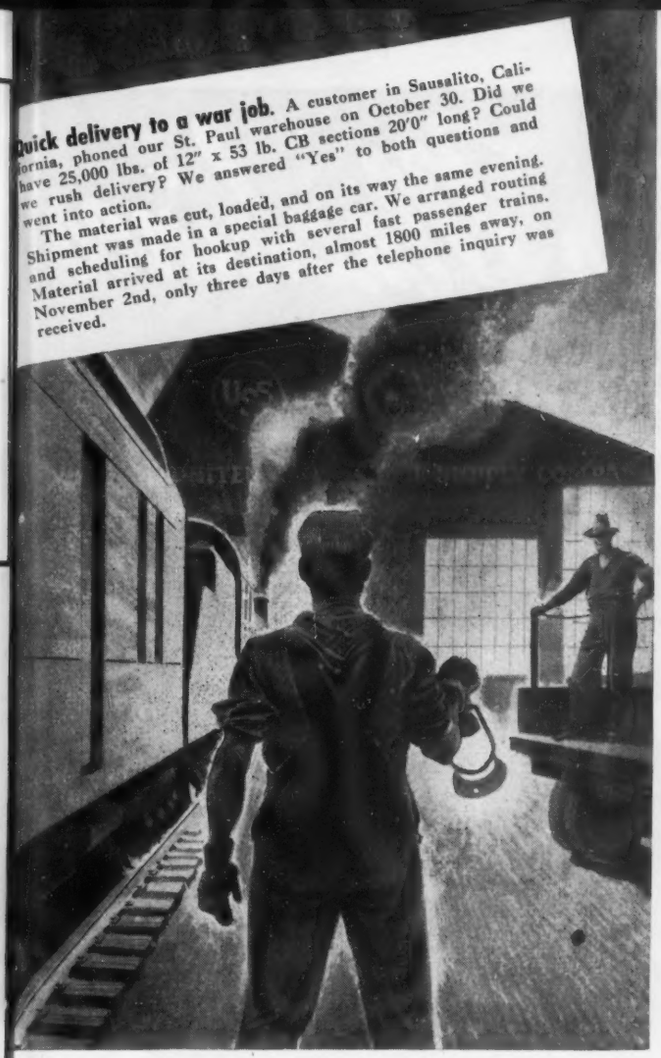

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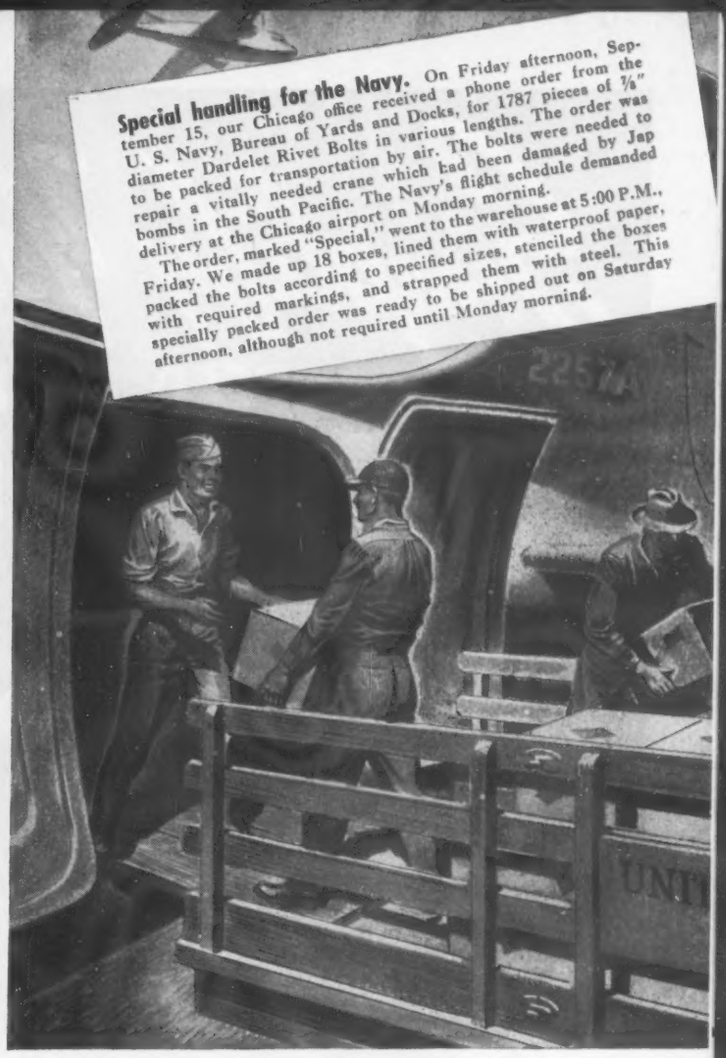

Special handling for the Navy. On Friday afternoon, September 15, our Chicago office received a phone order from the U. S. Navy, Bureau of Yards and Docks, for 1787 pieces of ⅞" diameter Dardelet Rivet Bolts in various lengths. The order was to be packed for transportation by air. The bolts were needed to repair a vitally needed crane which had been damaged by Jap bombs in the South Pacific. The Navy's flight schedule demanded delivery at the Chicago airport on Monday morning.

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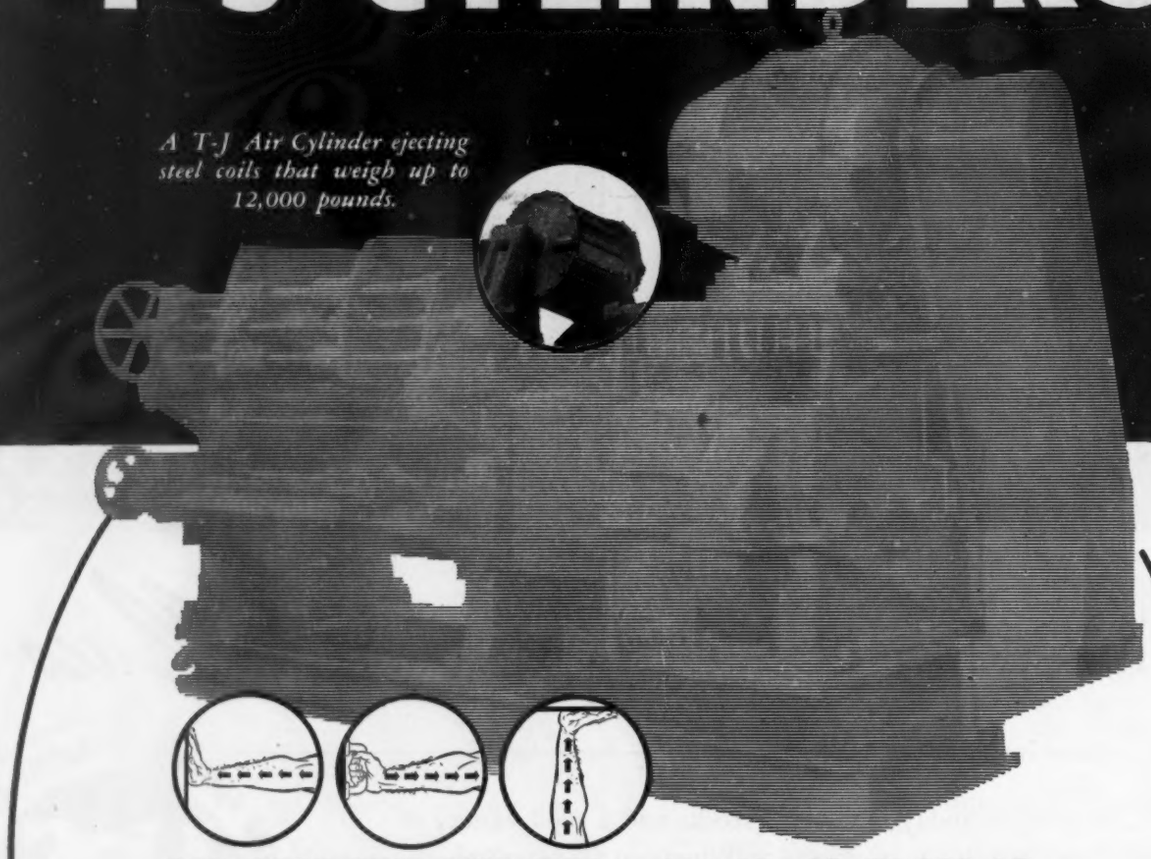

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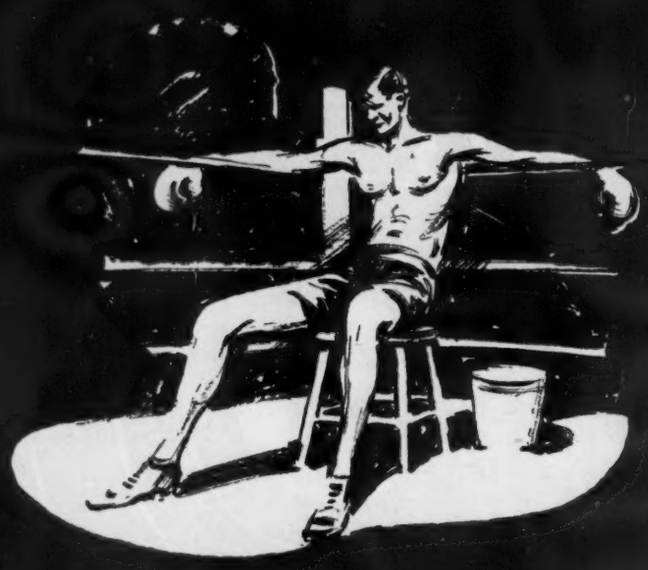

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STEEL

The Magazine of Metalworking and Metalproducing

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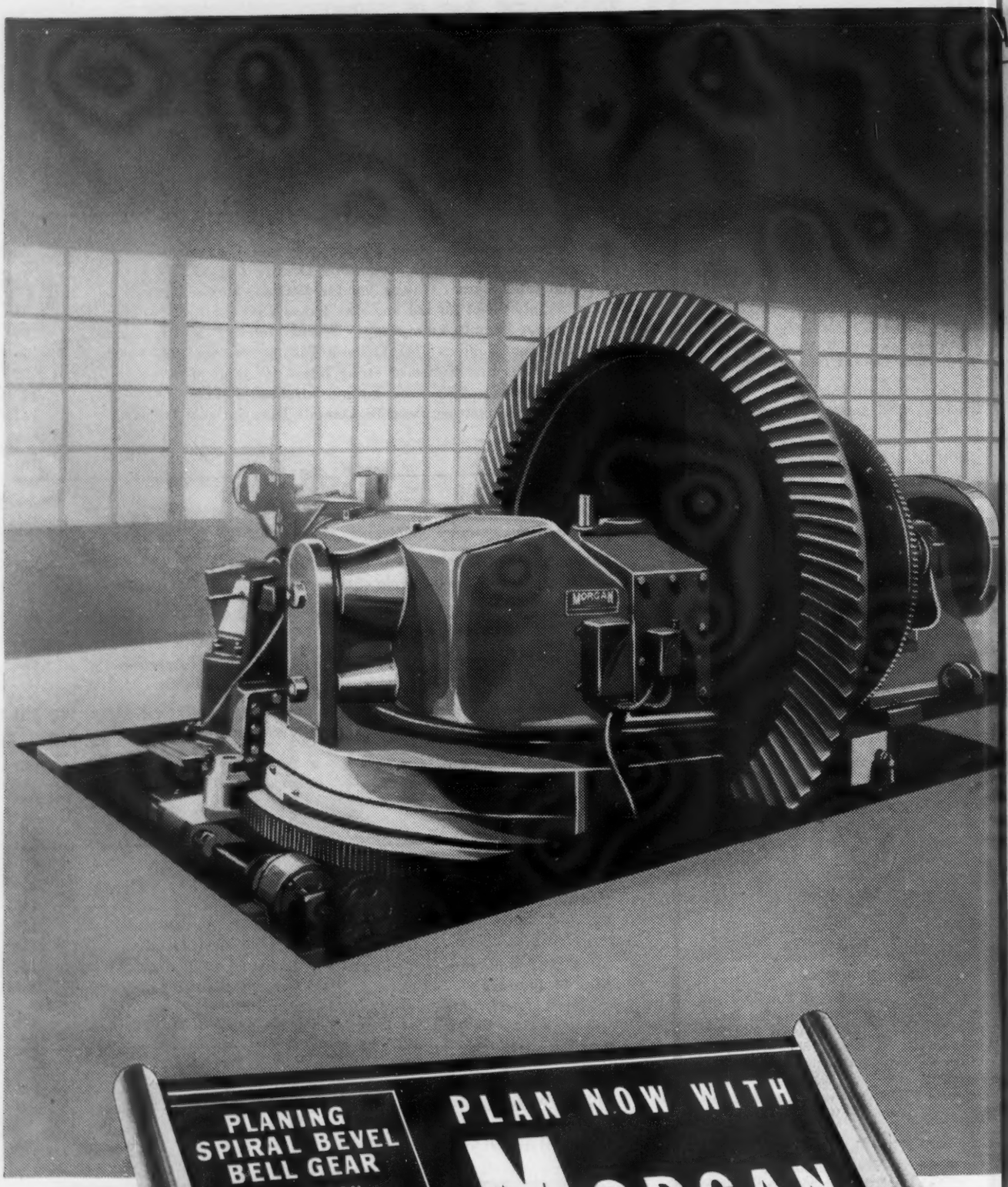

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STEEL
March 5, 1945

A Choice of Methods

While the Yalta conference and domestic manpower and war production problems have deflected attention away from the economic program advocated by President Roosevelt in his opening message to the new Congress in January, the subject is by no means dead or forgotten. His proposal to key the nation's economy to the objective of full employment is a fundamental part of fourth-term policy. As such, it will figure prominently in discussions of national affairs during the coming months.

Apparently the President's idea is to try to sell the public on a plan which would guarantee jobs for all who desire them, adequate housing, medical care, education, recreation and leisure and freedom from the worries of poverty, disability or old age. He places great emphasis upon the fact that all of these benefits are to be sought through the expansion and promotion of the existing system of private enterprise, with the government standing by to help only when the resources of private enterprise prove to be inadequate.

Almost every progressive industrialist in the nation will agree that this objective is desirable in principle. Forward-looking industrial leaders for some time have realized that if the system of private enterprise is to survive the present world revolution, it must demonstrate its capacity to fulfill reasonable social requirements satisfactorily. While these industrialists may agree with the President as to broad objective, they will question his method of achieving it.

This doubt arises from past experiences with New Deal social experiments and from Henry Wallace's attempts to explain the President's program. From these indications, it is clear that the New Deal concept of a national economy geared to social objectives is an economy involving super-planning, with intricate push-button control from Washington.

Under an economy of this kind, freedom of action by the owners, managers and employes in private enterprise gradually would disappear under the ever increasing need of strengthening and expanding federal control from Washington. The inevitable result would be a totalitarian economy.

Given a reasonable freedom of action, private enterprise can fulfill the social obligations expected of it much better than if it is fettered too much with government planning, regulations and restrictions. That is why progressive industrialists like Paul Hoffman and Eric Johnston are for giving private enterprise a fighting chance to do the job on its own, with as little assistance from Washington as possible.

Their plan may be weak politically but it is ultra-sound as to economics.

NEXT ROUND COMING UP: Odd circumstances are setting the stage for another thriller in labor strife. The abnormally severe winter has reduced stocks of coal to a dangerously low level. Past tampering with the "Little Steel" wage formula has emboldened John Lewis to add his weight to the forces that are trying to break this hold-the-line barrier. Belatedly Assistant-President Byrnes has invoked a curfew to conserve fuel supplies and the public representatives of WLB have come out with a report showing why the wage formula must be upheld.

Lewis will be a grim antagonist in this ring of intrigue. Already he has intimated that a strike is possible and that his miners are in a dispute with operators. The latter deny that there is a dispute. They declare a willingness to negotiate a fair wage agreement within the limitations permitted by federal law. This means, of course, that the operators have little to say about the negotiations. The issue is be-

(OVER)

tween John Lewis and the government or—because Mr. Roosevelt chooses to be his own policy-maker in labor affairs—between Mr. Lewis and Mr. Roosevelt.

The resourceful miners' leader has won every round to date. Will he lose the decision coming up April 1? —pp. 97, 98

• • •

NEW CRISIS IN STEEL: Concern over the production of munitions is caused by the summary action of army procurement officials in issuing directives covering long-term contracts for materials and by the curtailment of production necessitated by recent severe weather and by manpower shortages. That munitions output in January fell only 1 per cent behind that of December and only 2 per cent behind schedule speaks volumes for the ingenuity of management in combatting the handicaps of weather and labor scarcity.

Time will be required to smooth out the confusion caused by the sudden action of the military in asking for long-term commitments. Already a number of former members of WPB have been formed into an emergency committee to review the situation of steel supply and demand for the second and succeeding quarters and to allocate supply to the most essential requirements.

These men did a good job on CMP; undoubtedly they will be equally effective in handling the new assignment. —p. 89

• • •

FAIR DEAL FOR ALL: We smile, sympathetically, at the dissension in the Smaller War Plants Corp. which caused S. Abbott Smith to resign in criticism of the leadership of Chairman Maury Maverick. This is not the first feud in connection with the worthy objective of giving "small business" a break, nor will it be the last.

The trouble arises from attempts motivated by politics to drive a wedge between big and small business. The government implies that a company employing more than 500 persons is big business and one employing fewer than 500 is small business.

This definition is cock-eyed. An employer of 400 persons may be the largest outfit in his industry and yet may be a pygmy with the smallest unit in another industry. It is impossible and futile to segregate the small from the large on a horizontal basis.

The objective of government should be to provide for a fair deal for all business, without fussing too much about size or age. —p. 101

IS THIS TREASON? Machines in a plant of the Dodge division of Chrysler Corp. have a rated capacity of finishing 225 gears per 8-hour shift. The management had determined that a fair rate of production on these machines would be 184 gears per shift. Seven operators agreed among themselves to turn out only 150 to 155 gears per shift, and deliberately restricted their outputs to this schedule. In spite of warnings, the men refused to increase their production and were discharged.

This was the beginning of an "unauthorized" strike in which 13,000 employes, as of March 1, had been away from their jobs from four to seven days. This is in violation of the no-strike pledge and of the union contract.

If WLB or the President pursues a weak policy in handling this case, it will be increasingly difficult for employers to maintain production schedules and plant discipline. Decisive action, which would be strongly supported by public opinion, might nip the growth of loafing and insubordination in the bud. —p. 105

• • •

TRICKY BUSINESS: When the OPA increased prices Jan. 11, 1945, on hot-rolled carbon plates; hot-rolled carbon sheets; galvanized sheets, roofing and siding; and rails, it went to great pains to state that the increases were in delivered prices, not in base prices. This was a stunt calculated to prevent warehouses from sharing in the price advance and thus to coerce them into furnishing certain data which OPA deemed to be essential to its operations. OPA lifted this ban as of Mar. 1, permitting warehouses and jobbers to pass on to customers the increased prices.

It seems to us that this kind of tricky business is becoming a too-common fault in our present government bureaucracy. Why should the personal whim of a government office-holder be permitted to confuse and annoy an entire industry and its customers just to crack-down—fairly or unfairly—on a small group? —p. 96

E. C. Shaner

EDITOR-IN-CHIEF

Many test casts are made in Inland's search for new and better steels.

Invest in Victory—Buy More War Bonds and keep them.

Steel samples from pilot casts undergo photo-micrographic analysis.

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Inland makes steel in heats of a few pounds each for experimental purposes, and in production heats of 100 to 150 tons. The small experimental heats are run in two induction type furnaces, located in an especially equipped department of the main laboratory. These pilot heats are the forerunners of the steels for tomorrow.

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It is Inland research that already has produced low-alloy, high-yield strength Hi-Steel, and lead-bearing, faster machining Ledloy. The newest creation of Inland research is Ti-Namel—the new vitreous enameling alloy steel to which a white enamel cover coat is applied direct to the base metal. Ti-Namel assures superior quality finish, longer life, and lower shop costs.

These new Inland steels, and those that are yet to come, will be important to manufacturers competing in peacetime markets.

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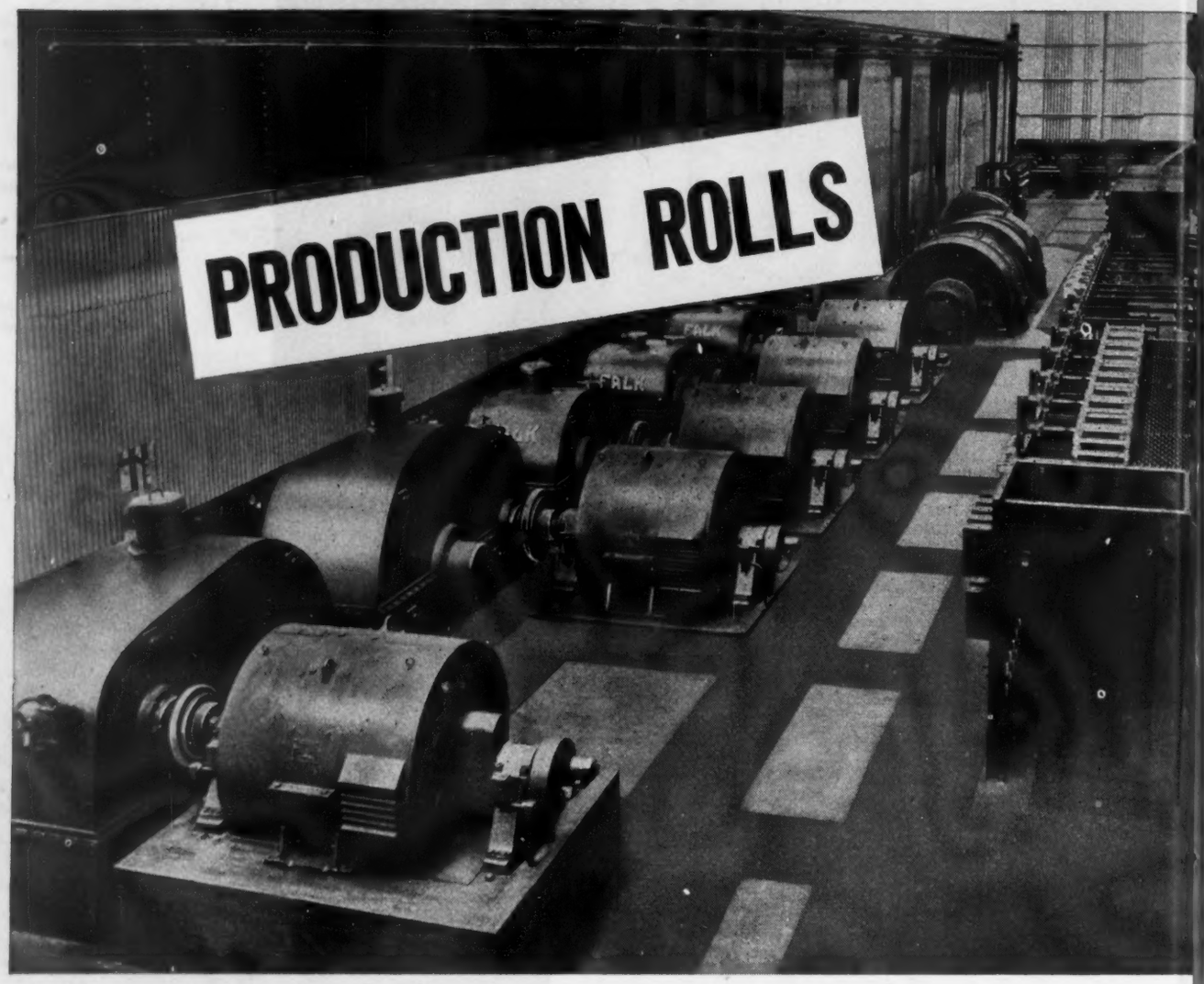

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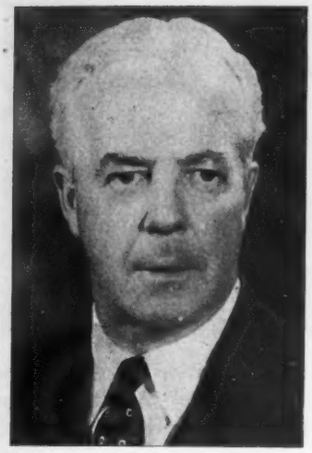
Committee To Study Supply, Demand



HILAND G. BATCHELLER

Munitions production seen threatened as weather, manpower shortage cut output. Directives by military officials covering long-term contracts held partially to blame for critical situation

NORMAN W. FOY

THE GAP between steel supply and demand has widened to an extent that will threaten seriously production of munitions during the second and succeeding quarters. Partially this is due to a shortage of manpower, to severe weather and overburdened transportation facilities, and partially to the policy of military officials, who have assumed greater control of war production in recent months, of flooding war plants with directives covering long term contracts. The latter has disrupted orderly distribution of materials and impeded production, according to industry spokesmen who note that in some cases allotments are used for as far ahead as the first and second quarters of 1946.

In an attempt to untangle the situation, the War Production Board has created an emergency committee to review the steel supply and demand picture for the second and succeeding quarters and to attempt to plan distribution so that essential requirements will be met.

Emergency Committee Membership

Members of the committee are: Hiland G. Batcheller of WPB, chairman; Norman W. Foy of WPB, as vice chairman; Brig. Gen. H. C. Minton, Army; Rear Adm. A. M. Charlton, Navy; Brig. Gen. William C. Rose, WMC; and H. M. Chapman, representing the Solid Fuels Administration. Mr. Foy recently returned to WPB from his post as general manager of sales, Republic Steel Corp., Cleveland. He formerly was director of WPB's Steel Division, and is now acting as special adviser to WPB Chairman J. A. Krug on steel problems.

Extended steel delivery schedules have caused some consumers to ask for WPB allotments as far ahead as first and second quarters of 1946, predicated on current production programs. Steel producers' order backlogs currently are higher than at any time within the past year. Several steel interests are reported to have protested to WPB over the extensive use of directives to inject new orders into already crowded schedules which in turn has resulted in reducing overall finished steel output because of the disruption to rolling schedules.

In emphasizing the seriousness of the current supply situation, WPB points out that in the six weeks through Feb. 18, steel ingot production ran about 90,000 tons weekly below the average rate for last October and November. This decline, combined with the heaviest military requirements for steel in the war period to date, and an increase in the proportion of allotment tickets "cashed" in the first quarter has brought about a difficult supply problem, with order books heavily overloaded and delivery dates greatly extended.

Carry-Over Tonnage Increasing

Owing to these developments, the volume of past-due orders on steel producers' books will increase 1 million tons or more this quarter, raising the carry-over tonnage into April to nearly 3 million net tons. This would represent the highest level in steel carry-over tonnage since the beginning of the Controlled Materials Plan.

Steady increase in steel carry-over tonnage has aggravated the second quarter steel allocation problem. Steel requirements for next quarter are stated at 17,475,000 net tons of carbon steel and 2,376,000 of alloy—a total of 19,851,000 tons, or about 24 per cent above the 16,050,000 tons estimated to be produced in the period. Peak in steel production for any one quarter was 17,164,000 tons in the initial three months of 1944.

Drastic cuts in second quarter steel allotments for exports, essential civilian and even military programs have been necessary to hold the carry-over tonnage within bounds and maintain the flow of steel to critical programs.

Second quarter steel allotments have been "screened" down to 16.9 million net tons, of which 2.1 million represent alloy steel. This overall tonnage is 105 per cent of estimated supply, but only 85 per cent of requirements. (Much of this second quarter steel, of course, is for third and fourth quarter finished munitions.)

The deepest cut in the civilian transportation equipment program since the last quarter of 1943 is evident in the slashing of the Office of Defense Transportation's carbon steel stated requirements for second quarter. ODT's second quarter program calling for 1,527,000 net tons of carbon steel has been reduced to an allocation of 1,065,000 tons, a cut of 30 per cent, and well below the allocation of 1,254,838 tons for the initial three months this year.

Stepped up demands for war production have necessitated a 23.5 per cent cut in amount of carbon steel available for allotment by the Consumer Durable Goods Division of WPB to manufacturers of about 60 classes of durable goods for use in the second quarter as compared with the first quarter. These cuts will be absorbed to varying degrees by the affected industries. Allotments of steel to manufacturers of dry cell batteries, photographic equipment, hospital beds, marine fans, pocket knives and other items needed in quantity by the armed forces will be cut slightly, if at all. Manufacturers making items used solely or mainly by civilians will feel the brunt of the cut-back.

Placed on Production Urgency List

Meeting even the reduced steel allotments for the second quarter will be difficult unless sufficient manpower relief is provided steel producers. Between 30,000 and 40,000 workers are needed immediately for blast furnaces, steelworks and rolling mills. WPB is working with WMC on the industry's manpower problem. To facilitate this, the industry has been put on the National Production Urgency list.

Second quarter steel supply problem

is particularly critical with respect to quality steels, and seamless pipe and tubes. These and other items are receiving special attention from WPB and the military. The Army is reviewing its requirements for these products for the second quarter and subsequent periods this year with a view of determining whether new facilities are needed for their production.

Steel Output To Drop If Manpower Losses Continue

Steel production is being lost by a lack of manpower and there must be no further separations, for military service or otherwise, that cannot be replaced by satisfactory new employes, if present output rate is to be maintained, members of the Steel Industry Advisory Committee, WPB, reported last week.

The committee states record ingot production of 89,552,961 net tons was achieved last year with an average of 571,200 employes. This compares with 633,036 employes in 1941, when ingot output totaled 82,839,259 net tons. The lengthening in the average work-week from 38.8 hours in 1941 to 46.3 hours in 1944 was the chief factor in making the large production gain possible.

As of Feb. 15 last, 154 open hearths were idle, representing 10,255,000 net tons of ingot capacity. Of this total, 92 units, or 7,422,000 tons, were down for repairs; 36 units, or 1,869,000 tons, were down for lack of labor; and 26, or 944,000 tons, were idle because of finished mill limitations, lack of fuel, raw materials and orders.

At least 1.5 million tons of blast furnace capacity is idle because of manpower, and a substantial tonnage of electric furnace capacity is idle for the same reason.

If the industry were able to operate all of its ingot capacity today, it would find that manpower is a limiting factor in the finishing of steel. To operate at capacity the industry must have between 30,000 and 40,000 men.

NEW CHURCHILL TANKS: This is the first picture released for publication of the new Churchill tanks, mounting 95-millimeter howitzers. The monstrous machines are shown preparing for action near Tilburg, Holland. NEA photo

Weather, Manpower Shortage Curb Munitions Production in January

JANUARY munitions production declined 1 per cent from the December level, falling 2 per cent behind schedule.

Part of the failure to meet January production schedules was attributable to weather—the worst winter since 1918—with attendant difficulties in transportation, natural gas and coal shortages, and absenteeism.

More important than the decline in actual munitions output was the drop in output of raw materials—notably steel—and components. Most of this loss did not show up in finished munitions deliveries in January, but in many instances it will set back the program through the remainder of the first half.

Now for the first time in recent months the manpower shortage is felt as a problem which affects war production in general, War Production Board officials state.

Among the major classes of munitions programs, January production was ahead of schedule only in ammunition. Ships, guns and fire control, and combat and motor vehicles were behind schedule and behind December's output. Aircraft and communication and electronic equipment production failed to meet January's schedules, but production was ahead of December.

In the aggregate, January output was $63 million behind December—gains of $46 million in four categories being more than offset by losses of $109 million in three major programs.

The critical programs generally have steeply rising production schedules and most of them showed substantial gain in January. Rate of gain slowed down, however; the average increase was only 7 per cent over December compared with a December average of 13 per cent over November. The chief exceptions to the general rise in January production of these critical items were tanks and trucks, for which the schedules were set below December.

But while gains over December in production of these critical items were large, they fell about 4 per cent short of expectations. The critical aircraft models, in the aggregate, were 13 per cent below the first-of-the-month schedule. Mortars and military items missed January schedules by 5 to 30 per cent. Heavy-heavy and light-heavy trucks were each 5 per cent behind forecast. In groups that approximated or exceeded forecast levels—including tanks, naval ordnance, field and assault wire, critical ASF ammunition, cotton duck, and Navy high-capacity ammunition—there were numerous individual items that failed to reach the predicted rates.

To meet forecasts for February production, January levels had to be topped for all but two of the critical programs. By the second half of the year, when most of the current critical programs reach their peaks, gains ranging up to a high of 260 per cent above last December's levels must be registered. In most instances these peaks are below the level of requirements.

War production during January and February was more adversely affected by the critical fuel shortage than due to transportation tieups. Of the 862 industrial plants in the Appalachian region, which consume 100,000 or more cubic feet of gas daily, 271 are in the "exempt" groups, and it is estimated that these 271 lost an average of three days' supply of gas in January.

Bituminous coal production for 1945 is estimated at 570 million tons, compared with needs for 620 million.

Manpower continues to be one of the major problems to be overcome in meeting war production schedules. War Manpower Commission states employment on "must" production items has been increased, but the manpower needs for these programs are rising even faster. Later WMC's report on these plants showed that as of Jan. 26 last 181,000 workers were needed immediately.

Carriers' Steel Allotments Cut

Domestic equipment building program seen materially curtailed as result of slash in steel supply for the second quarter. Military car program not to be affected

WHILE there is every likelihood of work going ahead on railroad equipment for shipment abroad for military purposes, there may be some cutbacks in the near future on domestic equipment and also on equipment placed through the Foreign Economic Administration for export to South America and other points not directly identified with the war effort.

This is indicated by slashing of allotments of steel for car construction in second quarter, as just announced. The Office of Defense Transportation had requested 250,000 tons of carbon steel for the production of 13,500 cars. However, it has received authority from the War Production Board for 135,000 tons, which will allow for only 7500 cars, almost all of which will be box cars.

The ODT program for locomotives was met in full with an allotment of 30,000 tons of steel, but its railroad passenger car project was denied entirely, while only 252 tons were approved for building of 15 baggage and mail cars.

In all, ODT was granted a total second quarter allotment of 1,075,000 tons of basic carbon steel, against stated requirements of 1,527,000 tons. The new allotment also falls short of the first quarter grant for this purpose by 189,838 tons. The alloy steel allotment of 98,000 tons for domestic transportation fell short by 36,000 tons, of the 134,000 tons requested.

Rail Allotments Curtailed

Rail needs, said to be the most important of all the carriers' requirements, were curtailed to 417,000 tons for railroad use and 11,000 tons for transit lines. Although ODT had asked for 600,000 tons. Officials explain that a large part of this reduction resulted from mounting requirements for steel billets for artillery shells.

For track accessories, second largest item on the ODT list, the carriers will be allowed 209,000 tons, with an additional 5000 tons going to transit lines. The original request of ODT was for 300,000 tons.

For passenger-carrying highway transport, the allocation was 14,310 tons against 18,250 tons. Requests for 87,000 tons for motor trucks were met in full, but demand for steel for truck bodies, trailers and third axles was cut down from 31,800 to 23,500 tons.

Automotive replacement requirements will receive 130,000 tons of carbon steel, instead of 150,000 tons asked, and 155,000 tons received for first quarter. The request for 19,000 tons for inland waterways transportation was cut to 10,000 tons. Allotments also were made for various minor programs, including railway marine equipment and maritime diesel replacement engines.

Government Seeks Bids On Escanaba Iron Ore Dock

A $13 million government project in the form of one nearly-finished iron ore dock and 18,000 pilings for another has been declared surplus and bids for purchase of the property will be asked this month. A. B. Sundberg, examiner for Reconstruction Finance Corp., and G. H. Klemme, engineer from Defense Plant Corp., have arrived in Escanaba, Mich., to direct the disposal.

Included in the offering are the No. 1 ore dock, intact and finished except for installation of trackage, chutes and other ore loading equipment, and the pilings, driven in the water at the No. 3 dock, one-fourth completed, and at the old Milwaukee road ore dock. Construction equipment, tools, materials, wooden buildings and other items also are to go on sale.

The property was developed to offset any possible enemy action that might have been taken to impede production by blocking the vital Sault Ste. Marie locks, through which nearly all United States iron ore passes en route to mills.

Among possible bidders, Chicago & Northwestern Railway has two docks in Escanaba and the Milwaukee road operates in a pooling arrangement with Chicago and Northwestern, having abandoned two docks built in 1900. Iron ore received from the mines on the Milwaukee road lines in Upper Michigan now is loaded into boats from the Chicago & Northwestern docks.

Present, Past and Pending

■ FABRICATED STRUCTURAL STEEL SALES INCREASE
NEW YORK—January fabricated structural steel bookings for bridge and building construction increased to 39,590 tons from 37,004 tons in December, according to American Institute of Steel Construction.

■ COPPER PRODUCTS TIGHT FOR SPOT AUTHORIZATION USE
WASHINGTON—WPB considers it unwise to make any primary copper products available for spot authorization use. Second quarter allotments total 2,175 million pounds.

■ METALS CONSTITUTE BULK OF TREASURY PURCHASES
WASHINGTON—Steel and metal products, in dollar volume, constitute the largest proportion of lend-lease purchases by the Treasury Office of Procurement. Included are steel billets, shapes, structural steel, rails, and various types of alloy steels; fabricated metals of other kinds; mineral and metal concentrates used in metallurgy.

■ FLYING LABORATORY HALVES RADIO TEST TIME
BALTIMORE—A "flying laboratory" equipped with "tomorrow's radio and radar devices" has cut test hours by more than 50 per cent here at the Bendix Radio Division, Bendix Aviation Corp.

■ MARKET FOR 60 MILLION RADIOS ANTICIPATED
PITTSBURGH—A postwar market for 60 million home radio receivers, enough to keep the industry at peak production for six years, is anticipated by Westinghouse Electric & Mfg. Co., the company reported last week.

■ GE WORKERS PAID $232,735 FOR PRODUCTION IDEAS
SCHENECTADY, N. Y.—Production suggestions from employes, many of which accelerated the war program, netted General Electric workers $232,735 in awards during 1944, according to company tabulations. Total payment was for 19,488 ideas adopted, slightly fewer than the all-time high in 1943.

■ SHIPMENTS OF STEEL FORGINGS RISE TO 376,827 TONS
WASHINGTON—Steel forgings shipments increased 5 per cent in December to 376,827 short tons from 360,099 tons in November, reports the Bureau of the Census. December, 1943, shipments totaled 366,918 tons.

■ RULES LIMITING SPOT AUTHORIZATIONS EXTENDED 90 DAYS
WASHINGTON—Rules limiting spot authorization to civilian goods production in critical labor areas have been extended for 90 days beyond the original expiration date of March 1.

Chicago Job Program Guinea Pig fo

Area's stabilization plan covers women as well as men. Confusion results when program is inaugurated, due to conflicting directions of state, local and national WMC offices and to delay in interviewing workers

CHICAGO

AN EMPLOYMENT stabilization program, which may provide a guinea pig on which the necessity of national service legislation may be decided, has been imposed on the Chicago area. The plan, announced Jan. 18 and effective Feb. 5, is administered by the War Manpower Commission, Region VI, and applies to Area No. 2, embracing Cook and DuPage counties. With some modifications, the program is effective throughout WMC Region VI covering Indiana, Illinois and Wisconsin.

In essence, it requires:

1. Hiring of all workers in Group I and II labor areas only upon referral by United States Employment Service. This also includes women workers.
2. Referral of qualified workers is limited to high priority job openings until these needs are met.
3. Only USES offices can issue statements of availability.
4. Hiring and referral authority of employers and labor unions is highly restricted.
5. Unclassified activities with ten or more employes ordered to cut employe ceilings 5 per cent by Feb. 15 (later extended to Feb. 20), and another 5 per cent by March 15 (subsequently advanced to March 1 in Chicago and later extended to March 6).

Objective of the Chicago area employment stabilization plan is to assist WMC in bringing about: (1) Elimination of wasteful labor turnover in essential activities; (2) reduction of unnecessary labor migration; (3) direction of the flow of scarce labor where most needed; (4) maximum utilization of manpower resources; and (5) establishment of procedures for the orderly transfer of essential workers.

Commenting on the program, Dean William H. Spencer, WMC regional director, states: "If this program can be administered in Chicago so as to meet its urgent manpower needs, it can be successfully administered in any war production center. In that sense, and to that degree, it is a test of whether Congress should enact national service legislation."

The most drastic actions initiated in the program are the inclusion of women workers in Group I and II labor market areas in the priority referral system, and the reduction of unclassified activities employment ceilings by 10 per cent.

Employers affected by the ceiling reductions are considered in compliance with the program only when the following conditions are met:

1. Workers released are all of the male sex, if in the area director's judgment this is possible.
2. Workers are released in accordance with a procedure established by the area director and the latter has determined that they may be counted against the reduction imposed upon the employer.
3. The employer has supplied to each worker released and to WMC a written statement guaranteeing to each worker who has accepted employment in critical war production his seniority and reemployment rights and other privileges.

Regulations imposed upon unclassified employers are:

1. Should refer male workers to their local USES office to be interviewed, and if found suitable, referred to war work.
2. Should not discharge any work when referring such a worker to USE Each worker should, however, be give a letter to take to USES stating th this worker is being referred in accor ance with Regional Administrative O der No. 45 and that this worker's r employment rights will be protecte when he no longer is needed in w work. The employer will be advised USES either:

a. That the worker is not suitable f war work, in which case the employ should reassign the worker first refer and refer another male worker to USE or

b. That the worker is qualified f war work, that the employer should t minate his employment, and that the released worker will be credited towa the employer's required 10 per cent r duction, or

c. That the worker is qualified for w work but refused referral to a war jo In such cases, employers should ter nate the worker's employment and th released worker will be credited towa the employer's required reduction.

Workers shall be offered referral USES in the following order:

1. To jobs utilizing the worker's hig est skill, in the order of the relative p ority ratings of the job openings.

fo National Service Law

By E. F. ROSS
Associate Editor, *STEEL*

Overcrowding of USES offices with workers waiting to be interviewed featured the inauguration of the Chicago employment stabilization program. Many man-hours were lost by men and women waiting to be interviewed. Note high proportion of women in waiting crowd. International News Photos

2. To jobs utilizing a skill closely related to his highest skill.

3. To jobs for which the worker is qualified, but not necessarily utilizing his highest skill or a skill closely related to his highest skill.

4. To jobs utilizing the worker's highest skill in activities which are essential or locally needed, but which do not have priority ratings.

5. To jobs utilizing a skill closely related to his highest skill in activities which are essential or locally needed, but which do not have priority ratings.

The following are deemed justifiable reasons for refusal of a worker to accept referral:

1. If the referral is not to a job opening in an occupation which will use his highest skill or in an occupation which will use his highest related skill, and such job openings are available in other activities of equal or higher priority.

2. As a condition of accepting the job or continuing in the offered employment he would be required to join, or refrain from joining, a labor organization.

3. The referral is to a job vacant because of a labor dispute.

4. The wages or working conditions of the job offered are below standards fixed by applicable law.

5. The wage rate offered is less than the minimum of an applicable bracket.

6. He can show that the job offered would involve for him an undue personal hardship.

In the week before Feb. 15, much confusion arose in the referral of workers to USES. This was due partly to conflicting directions of the national, state and local WMC offices, and partly to the USES offices being swamped with workers referred to them. Persons going through USES ran 80 per cent above the preceding month. Many man-hours were lost by workers waiting to be interviewed, although interviews required an average of only 15 minutes. Subsequently, the regional WMC announced that employers would be considered in compliance with Order No. 45 if they had begun to refer the initial 5 per cent installment of workers to USES on or before Feb. 15 and had completed the referral of the 5 per cent by Feb. 20.

About 15,000 firms in Cook and Du Page counties, employing 1,000,000 men, are involved in the manpower program. About 450,000 of these workers are in locally needed industries, such as restaurants, laundries, coal yards, suppliers of foodstuffs, etc., and are considered for exemption. Remaining are about 550,000 workers in nonessential trades. From these WMC hopes to get at least 25,000 workers for war plants.

However, Dean Spencer charges that war plants have developed a "high selectivity complex," which is defeating the manpower program. Plants are replacing marginal employes by selecting only the cream of those referred to the companies by USES, he says. "We did not expect any such development. The only way it can be stopped now is by education."

Pending bills in Congress if passed will stop the practice, he continues. The May bill will permit Selective Service to send men to a plant and the Kilgore bill will allow taking away high priority ratings. These bills will handle plants which become too choosey.

It is estimated that the Chicago district requires 70,400 additional workers by March 15, an additional 90,600 by May 15, and 107,500 by July 15. There is an immediate demand for 16,200, principally men. The most serious shortage is in unskilled male labor.

In this connection, one large district steelmaker reports that its labor position has been improving markedly since Jan. 1 as a result of the current drive to recruit new workers and the "work or fight" pressure of Selective Service. Although it continued to lose ground until the past month, this steel mill found net losses week by week to be growing smaller and for the month ended Feb. 17 registered a gain of 19 workers.

Within the past 30 days, Selective Service has cracked down on war plant job jumpers. In Illinois 1440 men, 800 to 900 in Cook county boards, have been ordered reclassified. Restoration of jobs is promised if the men return.

An incongruity in the Chicago area manpower situation is the startling fact that in January 13,097 Illinois workers applied for unemployment compensation insurance. Of these, 11,200 received unemployment checks averaging over $16 per week; the balance were in their week's waiting period. Some 6600 of the workers live in Cook and DuPage counties where manpower shortage is the most acute.

State officials explain the reasons for unemployment as layoffs for inventory; seasonal layoffs; weather—such as that recently which delayed the return of coal cars to mines; war contract revisions temporarily slowing plant operations; and Illinois Unemployment Compensation act.

Steel Supply Short for Oil and Gas Industry's First Half Needs

Chief difficulty is scarcity of billets for seamless tubing and skelp for pipe. Tubing facilities taxed by demands of rocket program. Manpower shortage preventing capacity operation of mills

STEEL supply for the oil and natural gas producers, refiners and pipe line operators has tightened considerably since the first of the year and is expected to grow more acute throughout the remainder of the first half.

Chief difficulty is the shortage of billets for making seamless tubing and scarcity of skelp for production of pipe. Huge increase in the rocket program is reported taking practically all available production of tubing mills, while manpower shortage is preventing full capacity operations at these mills. Oil country goods output is well below demand, and pressure tubing needs continue to increase. Black pipe shipments are expected to be heavier in the next few months due to the lack of galvanizing facilities and zinc, and the shifting of some galvanized tonnage to black pipe.

Second quarter carbon steel requirements of the petroleum industry (before final screening by the War Production Board) have been placed at 436,000 net tons. This represents a substantial increase over stated first quarter requirements of 397,000 tons. However, with overall second quarter carbon steel requirements of 17.5 million tons substantially in excess of estimated steel production for the period of 14.5 million, actual allocation of steel to the petroleum industry for the June quarter is expected to be considerably less than stated requirements. As long as military steel requirements continue to increase it is expected to be steadily more difficult to obtain materials for petroleum drilling and refining operations.

Constant attention must be given to supplying the upward trend in demand for crude petroleum to keep the refineries operating. This means that exploration, drilling, production, pipe lines and other means of transportation must be co-ordinated with the demand for finished petroleum products.

There were 1800 rotary drilling rigs in operation in the United States on Jan. 1 last, against 1300 at the start of 1944. From a materials viewpoint, this increased drilling program accentuates the overall supply problem, with oil country tubular goods, especially, becoming a serious choke point. The Petroleum Administration for War states tentative second quarter estimate of requirements for seamless and electric weld tubular goods are: Military needs 329,200 net tons; petroleum requirements, foreign and domestic, 332,000; total requirements 661,200 tons. Since mill capacity is 516,000 tons for the quarter, output will be at least 145,200 tons below indicated requirements. If additional facilities cannot be obtained and should the bulk of the adjustment fall upon the petroleum program, it will mean that tubular goods will be available for only 3400 new wells in the second quarter, compared with a program of 6900.

With the tremendous increase in production schedules of B-29 superfortresses (having four 2200-horsepower engines) high-octane gasoline refining facilities again must be expanded. Five new plants are scheduled for construction and proposals for several more are under consideration. Plants now scheduled are: One for the Texas Co., Lockport, Ill.; two for Standard Oil Co. of Indiana at Whiting, Ind., and Sugar Creek, Mo.; one for Leonard Refineries Inc., Alma, Mich.; and one for the Shell Oil Co., Houston, Tex. New facilities approved by PAW will be built entirely by private capital at a cost of $78 million.

The materials supply situation for the petroleum industry, however, does show

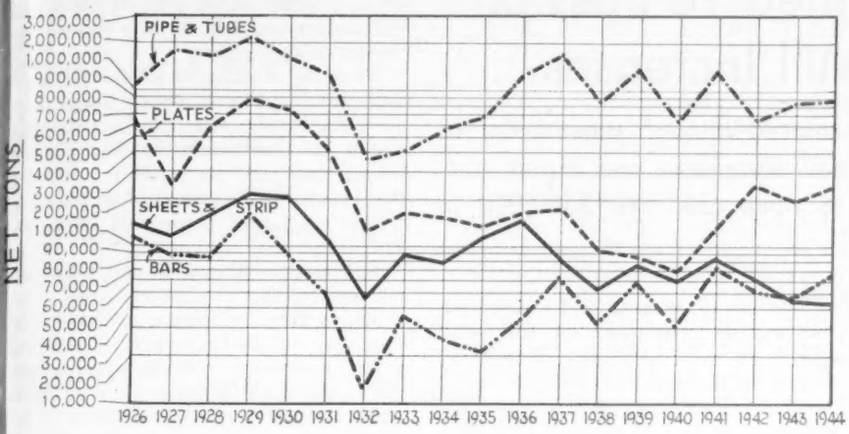
Breakdown of Steel Mill Product Shipments to the Oil and

(Net Tons)

Products†	1944*	1943	1942	1941	1940	1939	1938
Semifinished (ingots, blooms, billets, slabs, tube rounds, sheet and tin bars)	16,800	14,966	7,344	10,061	30,628	.....	.....
Structural shapes and sheet piling	48,500	36,390	59,025	57,334	28,308	42,473	32,603
Plates (universal and sheared)	240,000	197,218	244,991	130,073	68,596	86,368	93,547
Rails—60 lbs. and over	300	150	218	122	.....	.....	.....
All other rails	20	8	129	94	.....	.....	.....
Total rails	320	158	347	216	.....	16,651	6,523
Tie plates and track accessories (incl. track spikes)	180	157	66	144	117	6,240	2,199
Hot-rolled bars (carbon, incl. hoops and bands)	24,800	28,822	41,552	49,063	14,419	.....	.....
Concrete reinforcing bars	.....	.....	3,139	1,169	620	19,614	17,440
Alloy bars	36,000	14,968	5,191	19,412	16,329	.....	.....
Cold finished (carbon and alloy)	5,000	3,086	1,577	4,345	.....	.....	.....
Total bars	65,800	46,876	51,459	73,989	31,368	59,221	32,630
Pipe and tubes	850,000	820,069	648,981	1,355,415	815,984	1,370,398	859,429
Wire rods	.....	55	672	1,635	316	.....	.....
Wire and wire products (incl. fence posts)	5,800	4,691	7,519	5,045	5,278	22,978	16,068
Black plate	350	497	90	904	1,999	26,086	10,999
Tin and terne plate (hot and cold reduced)	650	313	991	6,217	6,189	.....	.....
Sheet and strip:							
Hot-rolled	40,000	43,344	54,292	76,400	44,264	.....	.....
Cold reduced	1,800	1,534	4,843	2,467	1,805	.....	.....
Galvanized	2,000	117	851	2,901	13,117	3,625	1,802
All other	.....	34	30	123	.....	.....	.....
Total	43,800	45,029	60,016	81,891	59,186	74,352	52,048
Tool steel bars	50	84	210	480	1,398	.....	.....
Wheels and axles	50	.....	.....	.....	.....	.....	.....
Forgings	.....	1,553	1,248	1,248	.....	.....	.....
Steel castings	.....	441	549	695	.....	.....	.....
All other steel products	100	3,467	3,931	6,976	11,495	110,250	49,928
Grand Total	1,272,400	1,171,964	1,087,439	1,732,323	990,876	1,815,017	1,155,972

*Estimated. †Including pipe lines. Blank spaces indicate figures not available.

PETROLEUM INDUSTRY'S STEEL PURCHASES INCREASE



some indication of improvement in a few categories.

Deliveries of internal combustion engines from manufacturers is improving and the outlook for 1945 is more favorable than last year.

An increase in tool joint deliveries is reported, and output is expected to continue upward through March when the last of the new machinery for the expansion program is scheduled to be installed. The drill-pipe situation will be improved by the increase of tool joints but it may be adversely affected by the conflict with the military requirements in pipe mills.

Supply of pumps does not present any particular difficulty, but a long leadtime is required for motors needed for electrically driven pumps.

Pressure vessels are presenting a scheduling problem in certain plants.

Boilers are becoming more critical due to the lengthening mill deliveries on structural shapes, plates and tubes. Fabrication after receipt of materials does not present a problem at present nor do boiler accessories.

Industrial instrument manufacturers are in fairly good position and the general lead time is from 4 to 8 weeks, depending upon the complexity of the instrument.

Supply situation in the electronic field is subject to considerable variation. Electronic components such as tubes, condensers, resistors, etc., can be obtained without too much difficulty. However, assembled equipment such as radio receiving and transmitting equipment, electronic test equipment and transformers, are tight.

Pipe line construction in 1944 slumped sharply as the war emergency building program passed its peak, and prospects are that it will decline further during 1945.

A total of 4961 miles of new pipe lines was completed in 1944, marking the first time since 1940 that the figure fell below 7000 miles.

Majority of the new oil pipe lines, both crude and products, which have been built during the war are expected to continue as an integral part of the petroleum transportation system in the postwar period.

While detailed figures are not available on wells planned for the year abroad, it is well known that oil companies in South America have plans for increasing the number of wells drilled this year. Mexico and Canada also will probably see an increase in drilling operations in 1945. An additional large tonnage of oil country goods will be sent to Russia this year.

Close to 25,500 wells are expected to be drilled in the United States this year, an increase of about 5 per cent over the 24,076 wells drilled in 1944.

In 1944 the oil and natural gas industry purchased 1,272,400 net tons of steel mill products, the largest yearly total since 1,732,323 tons were purchased by the industry in 1941. Pipe and tubes and plates continued the leading steel products consumed by the petroleum industry in the past year.

Gas Industry by Product Classification from 1926 Through 1944

(Net Tons)

1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,469	23,026	24,331	26,519	8,389	45,072	41,960	144,344	97,945	30,001	100,716
1,267	135,195	154,177	161,557	124,154	402,724	721,312	880,817	587,877	241,693	674,968
....	.....	.....	.....	.....	.....	.....	3,565	925	2,745	31
.....	.....	.....	.....	.....	.....	.....	5,223	1,589	1,884	8,027
95	12	.....	785	21	3,143	4,622	8,788	2,514	4,629	8,058
784	78	34	81	13	351	619	1,786	937	1,060	2
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
626	3,792	3,181	620	2,137	8,644	19,149	1,744	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
777	21,430	25,333	35,728	12,384	48,565	85,395	159,510	85,811	88,551	112,506
182	664,233	565,247	404,037	356,089	1,240,008	1,595,817	2,152,146	1,637,652	1,783,033	1,028,543
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
534	7,232	10,469	7,367	7,381	7,737	29,883	33,016	28,688	24,095	34,114
678	29,584	22,496	14,131	6,700	18,091	21,256	26,923	49,176	68,466	41,853
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
930	2,942	3,480	5,347	3,546	17,412	22,764	30,925	38,715	23,906	.....
932	106,180	69,941	88,219	46,763	113,837	203,963	210,855	155,152	114,535	139,334
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
771	13,602	11,971	13,355	12,594	20,059	30,904	32,150	25,424	26,965	42,492
491	999,573	883,998	751,780	574,488	1,899,587	2,735,732	3,650,336	2,671,176	2,383,026	2,182,588

Figures for 1926-39 compiled by STEEL; for 1940-43 by American Iron and Steel Institute

Warehouses Permitted To Pass on Recent "Interim" Mill Increases

Confusion in steel pricing removed through amendment of OPA regulations applying to mill, warehouse and export markets. Distributors estimated to have absorbed $500,000 in higher steel costs since Jan. 11

EFFECTIVE March 1, warehouse and jobbers of iron and steel products were permitted by the Office of Price Administration to pass on to their customers the "interim" increases in mill ceiling prices for four basic steel products which became effective Jan. 11, and which up to this time the warehouses have had to absorb. This absorption, it is estimated in the warehouse trade based on tonnage handled between Jan. 11 and March 1, amounts to around a half million dollars.

The four basic products on which mill ceiling prices were increased Jan. 11 are hot-rolled carbon plates, increased 10 cents per 100 pounds; hot-rolled carbon sheets, increased 10 cents per 100 pounds; galvanized sheets, roofing and siding, increased 15 cents per 100 pounds; and rails, all types, increased $3 per gross ton.

It is understood most warehouses immediately raised their quoted prices on March 1 to reflect these mill advances, in the case of rails the warehouse price being increased 15 cents per 100 pounds to conform with the $3 per gross ton increase in mill prices.

Cannot Increase Some Prices

The increases are not applicable on sales of secondary hot-rolled carbon plates or sheets, galvanized sheets, rails or bright nails and staples at either the mill or warehouse level.

Authorization to the warehouses and jobbers to pass on these "interim" mill price increases is provided in amendment No. 12 to Revised Price Schedule 6. This amendment revises the previously issued amendment No. 11 so that the mill base prices "are increased." Price schedule No. 49, covering sales by the warehouses, is so worded that the mill increases may be automatically passed on by the warehouses and jobbers. Amendment No. 29 to revised price schedule No. 49 incorporates the advances in the warehouse schedule, while amendment No. 15 to the Second Revised Maximum Export Price Regulation permits addition of the increases in mill prices to export sales.

While the "interim" mill price increases on plates, sheets and rails were authorized on Jan. 11 the warehouses and jobbers were not permitted to pass on to their customers the higher prices they had to pay the mills after that date. They were permitted, however, to pass on an increase of 25 cents per 100 pounds authorized on the same date in the mill ceiling price of nails and staples, other than galvanized.

"Warehouses and jobbers were not permitted on Jan. 11 to pass on to their customers the 'interim' mill price increases provided for hot-rolled carbon plates and sheets, galvanized sheets and rails," states OPA, "because they had failed, for the most part to furnish OPA with financial information needed to determine whether the increases could be absorbed at the warehouse level.

"Since Jan. 11, 1945, however, the Industry Advisory Committee of the Steel Warehousing Industry has assured OPA that full financial information requested by the price agency will be supplied. These data are now being assembled, and will be used by OPA in a study to determine the extent to which warehouses and jobbers may absorb increases in mill prices.

"Pending examination of the financial data, warehouses and jobbers are to supply OPA for the study of the industry's ability to absorb cost increases, warehouses may pass on to their customers the 'interim' basic steel product price increases authorized at the mill level Jan. 11."

It was pointed out in the OPA announcement that the "interim" mill price increases are of a temporary nature and that they are to be revised or adjusted within the next few weeks when adjustments are made in prices of such other steel products as require increases at the mill level.

Granting warehouses and jobbers permission to pass on the "interim" increases to customers until then, OPA said, will enable warehouses to avoid any possible hardship pending the collection and analysis of the reports the warehouse industry is to supply OPA.

"At the time of any further increases or adjustments in the present 'interim' mill base prices, warehouse and jobber margins of markups will be examined and adjusted to reflect the industry's ability to absorb mill price increases," OPA said.

Machine Tool Builders Face Difficult Task in Meeting Requirements for 1945

MACHINE tool production will have to be raised well above the current rate if the badly needed tools for the ammunition and other war programs are to be shipped on time.

Order backlogs of machine tools Dec. 31 last included $200 million of rated orders, plus some $60 million of unrated orders. To this will be added some $300 million of tools for expansion of production in military programs in 1945, if present forecasts materialize. This would more than absorb the total production of the industry for the entire year at the present $35 to $40 million monthly production rate.

The tools program for the heavy artillery ammunition is now more than a month behind schedule. From Oct. 1 to the end of January, 2345 tools had been shipped, but the schedule called for shipments of 2827 units, the War Production Board states. It is expected that the bulk of the ammunition machine tool program can be completed by mid-March.

To this program has since been added the Dec. 1 program for tools for mortar and medium artillery ammunition and fuses.

More tools will also be needed for the recently-expanded truck and tank programs, perhaps $100 million worth. And there is a large number of other expanding programs that in the aggregate, will take perhaps $100 million more.

The machine tool industry's employment increased 0.9 per cent to 56,500 wage earners during January. Part of this gain was attributed to transfer of workers from other war contracts to machine tool production in the same plants. The industry's employment is 25.3 per cent below the January, 1944 level, when number of wage earners totaled 75,600 persons.

WPB reports machine tool production increased 1.9 per cent to $37,498,000 against $56,363,000 in like 1944 month and $117,384,000 in January, 1943.

Net new orders during January decreased $3,546,000, or 5.7 per cent, from the December total of $62,504,000.

Unfilled orders, including export and unrated orders, continued to increase throughout January, reaching an overall order backlog at the close of the month of $282,233,000. This is 8.2 per cent higher than recorded on Dec. 31 last. Between seven and eight months will be required to fill all orders on hand at the close of January at the current rate of shipments. Rated unfilled orders on Jan. 31 last totaled $187 million.

Lewis' Miners File Notice of Strike Intent

Tell government labor agencies that dispute exists before negotiations are opened with operators. Conference starts

FORMAL notice that a dispute exists in the bituminous coal mining industry was filed last week with the Department of Labor, the National Labor Relations Board and the National War Labor Board by John L. Lewis and the 250-member policy committee of the United Mine Workers of America.

The notice, required under the Smith-Connally act, is equivalent to a 30-day warning that a strike vote will be taken among the miners if their contract expires on March 31 without a new agreement being reached.

Challenging Mr. Lewis' position that a dispute existed before negotiations on a new contract were opened, coal mine operators said they entered the negotiation with a "sincere and honest desire" to reach an agreement in the speediest possible manner without threats of a stoppage. They appealed to the miners' leader to lay aside the "usual differences and squabbles" in the interests of reaching agreement on a new contract.

Representatives of the miners and the coal mine operators opened negotiation on the union's demands last Thursday.

Mr. Lewis in his letters to the government agencies denounced the attitude of government agencies and charged the government with planting inspired stories to "propagandize the American people into a hostile and embittered attitude" toward the miners.

The seriousness of the coal situation is indicated by the fact that bituminous production for 1945 is estimated at 570 millions tons, while requirements are expected to be 620 million tons, leaving a deficit of 50 million tons. At the first of the year, above ground stocks of coal amounted to a 31-day supply, or 57 million tons.

Minimum Wage Rate Boost To 55 Cents Approved

Increase of minimum wage rates in all industries to 55 cents an hour was approved in a ruling of the War Labor Board last week. In it, the board increases from 50 to 55 cents an hour the dividing line between what it now considers substandard pay and that providing a decent standard in wartime.

Thousands of workers are affected by the ruling but it does not go into effect automatically, the board authorizing its regional boards to approve hourly wage rates up to 55 cents where employers seek the increase or the union and employer join in a request.

In dispute cases, the board authorized its 10 regional units to "take into consideration appropriate prevailing rates in making their determinations."

The action makes possible a wide extension of the 55-cent minimum voted for the textile industry recently.

The resolution adopted by the board provided that any adjustments made either in voluntary or dispute cases are subject to executive directive of May 12, 1943.

War Labor Board Rules For Fixed-Term Contract

Collective bargaining agreements between the steel producing subsidiaries of the United States Steel Corp. and the United Steelworkers of America-CIO will be frozen to Oct. 15, 1946, the War Labor Board ruled last week. Industry members of the board dissented.

The issue of termination was the only one remaining in dispute when the companies and the union concluded negotiations for a new agreement incorporating the provisions of the board's Nov. 25 directive several weeks ago. The union asked for a firm contract until the fall of 1946 while the companies wanted a provision whereby the contract could be reopened for new negotiations after notice by either party.

Weirton Steel, Union Sign Wage Agreement

Weirton Steel Co., Weirton, W. Va., and the Weirton Independent Union Inc. have signed a supplemental agreement to their wage contract which puts into effect the provisions of the War Labor Board's recent directive covering wage increases. The agreement is retroactive to Dec. 1, 1943.

All provisions of the new agreement will go into effect with the pay period beginning March 11, in the steelworks, Weirton shell line and sheet mill departments: and with the pay period beginning March 18, in the tin plate, strip steel, Steubenville, and Steubenville shell line departments.

L. S. Lafferty, president of the Weirton Independent Union, Inc., said the union is the first in the steel industry to complete and sign a contract under the terms of the board's directive. Mr. Lafferty also said that the effective date of the new wage increase for Weirton workers giving them retroactive pay to Dec. 1, 1943, exceeds the back pay won by all other steel industry unions.

POSTWAR PREVIEWS

POSTWAR WAGES— Public members of War Labor Board suggest new concept of wage stabilization to prevent inflation after victory in Europe. Would provide minimum rates for limited number of key occupations in various industries. See page 98.

AUTOMOBILES— Secretary of Treasury Morgenthau's prediction that automotive export market may amount to a million cars annually doubted by trade officials. See page 105.

POSTWAR AIRLINER— Streamlined transport to be built by Consolidated Vultee Aircraft will have capacity for 204 passengers and more than 15,000 pounds of baggage and mail. Will be used by Pan American on long-distance routes. See page 112.

POLAROGRAPHIC INSPECTION— Method of determining even minute amounts of elements (as little as 0.0001 per cent) in complex metal alloys is extremely fast, sensitive and carried out with simple equipment and easily learned and calibrated procedure. The process will contribute to closer metallurgical control after the war. See page 122.

GAS WELDED TUBING— New automatic tube mill with gas welding heads consisting of 3-torch, 160-orifice units divided into preheating, heating, and welding sections produce tubing from 2500-pound coils of strip at remarkable speed. Application of this familiar welding technique to automatic tubing production may lead to other applications later on. See page 124.

MEASURING METALS BY SOUND— Developed for wartime aircraft to determine the thickness of inaccessible metal sections after machining, this method for checking by high frequency sound waves may find many postwar uses. See page 131.

Little Steel Wage Formula Must Be Retained, Say WLB Public Members

Find industrial wages have outrun increase in cost of living. Warn further advances in hourly rates would bring on disastrous inflation. Industry members uphold report. CIO and AFL spokesmen dissent sharply

INDUSTRIAL wages have increased more than the cost of living and no change in the Little Steel formula is warranted at this time. This is the gist of a report to the President by the public members of the War Labor Board on the relationship between prices and workers' earnings. It is challenged by the organized labor members of the board, who are threatening to withdraw from WLB. The report, however is supported by the industry members.

"The time has not yet come, in our judgment," said the public members' report, "when general wage increases can be freely resumed without danger of an inflation which would be disastrous to the war effort and to the economic security of all segments of our population."

The public members selected as the measuring rod of wage increases the "average straight-time hourly earnings statistically adjusted to discount the movement of workers into the higher-paid war industries." On this basis they find that earnings for all manufacturing employes increased 36.7 per cent between January, 1941, the base date of the Little Steel formula, and October, 1944. The cost of living, as determined by the President's special committee, has increased 29.4 per cent during the same period.

Unions Get Severe Setback

The report is viewed as one of the most severe setbacks yet handed the labor unions in their campaign to break the wage stabilization program. It is the document which President Roosevelt repeatedly has said he was awaiting before acting on labor's pleas for abandonment of the Little Steel formula.

The public members' report was vigorously attacked by both the Congress of Industrial Organizations and the American Federation of Labor.

Philip Murray, CIO president, announced that an extraordinary session of the executive board of the CIO will be convened soon to determine what steps must be taken to bring about a complete revision of policies governing the activities of the National War Labor Board "to permit a substantial adjustment of wage rates." He declared, however, that CIO would continue to observe its no-strike pledge.

"The situation in which labor now finds itself is simply intolerable," Mr. Murray said. Claiming there has been an emasculation of the power of the board in wage disputes because decisions have been subjected to review of the Office of Price Administration and of Director of Economic Stabilization Vinson, CIO members have taken the position that under present conditions they do not see how they can discharge their responsibility to the nation and to labor. This is construed as a warning they are considering resigning en masse.

American Federation of Labor members were equally emphatic in their disapproval of the public members' report. Their statement called upon the President "to prevent the occurrence of economic disaster by modifying realistically the Little Steel formula through a change in the wage policy of the NWLB." They claimed that the cost of living has moved steadily upward "until today it is twice the 15 per cent allowed by the Little Steel formula to offset the disparity between wages and living costs."

The investigation upon which the reports were based arose from the allegation by labor unions that under the stabilization rules, since the Little Steel formula was adopted, wages have been "frozen" while prices have so risen as to bring about a substantial disparity between price levels and wage levels and an inequitable impairment of peacetime wage standards.

The public members, however, did not find this allegation to be true. As shown in the accompanying charts they said average straight-time hourly earnings, for all manufacturing employes increased 12.5 per cent from October, 1942, to October, 1944, while the overall increase from January, 1941, to October, 1944, was 36.7 per cent. October, 1942, is the date of the passage of the Stabilization act, while January, 1941, is the base date of the Little Steel formula. These earnings were statistically adjusted to discount the movement of workers into the higher paid war industries and measure the changes in the average pay for an hour's work received by employes who have not shifted from the industry in which they were customarily employed. This measuring rod includes, however, the effect of certain other wartime factors, the most important of which are shifts of employes within an industry from lower paid to higher paid localities, accelerated merit increases and promotions, increased shift premium payments, and abnormal incentive earnings.

Beyond this increase in adjusted straight-time hourly earnings, public members of the board found that there has been a substantial improvement in the economic status of the average wage earner since January, 1941, because of the concentration of wage earners in the higher paid war industries and the increase of overtime work at premium pay, and more continuous employment.

"Thus, average straight-time hourly

MEXICO CITY CONFERENCE: President Manuel Avila Camacho of Mexico welcomes delegates to the first session of the Inter-American Conference at Mexico City. NEA photo

CONE AUTOMATIC MACHINE COMPANY
sees many
GOOD THINGS AHEAD

It is reported that . . . . . .

Helicopters capable of lifting as much as 15 tons and of carrying 35 or 40 persons, plus mail and baggage, are believed by one expert to be within the realm of possibility. *Col. H. F. Gregory, Engineering Division, Materiel Command, U.S.A.*

get ready with **CONE** for tomorrow

A pilot flying between South America and Africa recently flew across the Atlantic four times in three days. *Office of War Information.*

get ready with **CONE** for tomorrow

One of the country's leading department stores has scheduled a Postwar Fair for next May. Manufacturers are invited to participate, but space is not for sale. *R. H. Macy, New York City.*

get ready with **CONE** for tomorrow

Salvage apparatus for extremely great ocean depths has been patented. Its powerful jaws are guided by television apparatus. *Patent 2,355,086.*

get ready with **CONE** for tomorrow

Because of the high cost of converting ordinary electric power into high-frequency power, it is not at present believed that electronic cooking is practical for household use, although in commercial food processing it has great possibilities. Typical of its application to food processing is the recent experiment with packaged pancake flour in which the temperature inside the package was raised to 130 degrees in less than 30 seconds, completely destroying all insect life. *Scientific American.*

get ready with **CONE** for tomorrow

Rubber scientists think that they have solved the problem of ice on airplane propellors by the use of a three-ply rubber covering, the center layer of which is an electric heating element. *Goodyear Tire & Rubber Co.*

get ready with **CONE** for tomorrow

An inter-continental highway between Alaska and Siberia, by way of a tunnel under Bering Strait, is being seriously considered. *Alaska Highway Committee of Pacific Northwest Trade Association.*

Experiments are being made with plastic bottles blown in the same molds used for glass. *Advertising & Selling.*

get ready with **CONE** for tomorrow

A total of 29 dams is planned for the Pacific Northwest, the first six of which will cost 226 million dollars and provide power and water for a population of 2 million. *Engineering & Mining Journal.*

get ready with **CONE** for tomorrow

A new method of dyeing acetate rayon is said to make the colors practically fade-proof. *North Carolina Fabrics Corporation.*

get ready with **CONE** for tomorrow

A large airplane manufacturer has produced an experimental model of a 200 pound automobile. *Science Digest.*

The first commercial model of a sound-on-tape machine has been made and is said to play continuously for eight hours. *Fonda Corporation.*

get ready with **CONE** for tomorrow

The use of music in factories is expected to create jobs for 26,000 musically trained broadcast directors. *Science News Letter.*

get ready with **CONE** for tomorrow

A new device that opens and closes a window thermostatically is waiting for release of materials to go into production. *E. O. Gillen, 1713 N. Water St., Milwaukee.*

get ready with **CONE** for tomorrow

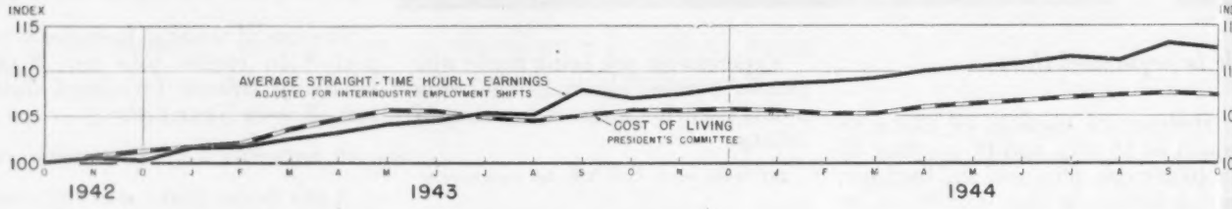
A new eight-engined flying freight boat with 320 foot wing span is expected to be ready about the first of the year. *Howard Hughes, Aviation News.*

get ready with **CONE** for tomorrow

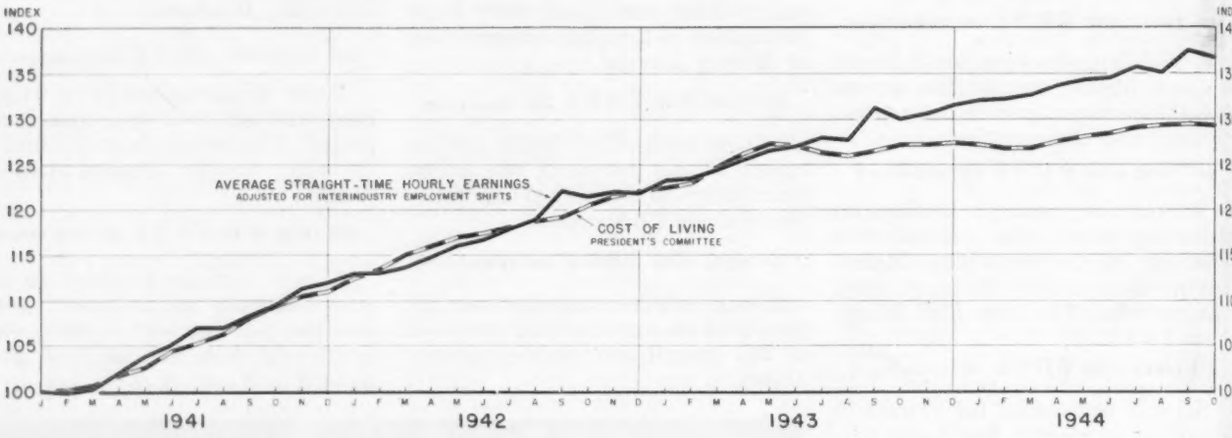
A new ingredient added to the Army's soap is said to make it work effectively in any sort of water, salt, fresh, cold, hot, soft, or hard. *E. I. duPont de Nemours & Co. Inc.*

Changes in Earnings in Manufacturing and Cost of Livin

Period: October, 1942-October, 1944; Base: October, 1942=100



Period: January, 1941-October, 1944; Base: January, 1941=100



earnings, without discounting the concentration of workers in the war industries," the report said, "increased 13.9 per cent from October, 1942, to October, 1944, and by 43.9 per cent from January, 1941, to October, 1944. Average gross hourly earnings, including overtime premiums, increased 15.4 per cent from October, 1942, to October, 1944, and 50.9 per cent from January, 1941, to October, 1944. Average gross weekly earnings increased 20.8 per cent from October, 1942, to October, 1944, and 76.3 per cent from January, 1941, to October, 1944.

"Changes in adjusted straight-time hourly earnings may be further statistically adjusted to discount such factors as shifts of employes within an industry from lower paid to higher paid localities; between-grade promotions; and shift differential payments. The resulting figures (urban wage rates) show changes in average straight-time hourly earnings by occupations. They may be said to measure the changes in average hourly earnings of these employes who remained on their old jobs in the same plant where they have customarily been employed.

"The average change in these hourly earnings by occupations (urban wage rates) from the stabilization date, October, 1942, to October, 1944, was 11.3 per cent. From January, 1941, to October, 1944, it was 30 per cent.

"Scheduled occupational wage rates constitute the basic foundation from which hourly earnings are derived, and under normal conditions changes in average straight-time hourly earnings may be assumed to follow in a general way changes in wage rate schedules. That relationship has been altered under the imposed controls of the wage stabilization program. General increases in scheduled wage rates since October, 1942, have been substantially less than the increases in adjusted straight-time hourly earnings over that period.

Only Small Rise in Wage Rates

"For the period from October, 1942, to October, 1944, the estimated increase in scheduled wage rates has been only 3.2 per cent for all manufacturing industries and 4.1 per cent for all industries measured in terms of straight-time hourly earnings of September, 1942. These earnings have gone principally to employes who had not received the Little Steel allowance; whose wage rates were far out of line with those prevailing in the area; whose wage rates were out of line with other wage rates paid in the same plant, or whose wage rates had to be increased to correct substandards of living.

"For the period from January, 1941, to October, 1942, during which period there was no control over voluntary wage adjustments, it is estimated that scheduled wage rates were increased 15 per cent. For the whole period from January, 1941, to October, 1944, the es mated increase was 19.7 per cent straight-time hourly earnings of Janua 1941.

"These are minimum figures, sin they do not include certain increases scheduled wage rates, the most imp tant of which are: Increases to corr substandards of living not requir board approval; increases to provi equal pay for equal work for wom employes; increases to groups of l than 10 workers prior to Oct. 2, 19 shift premiums and other 'fringe' a justments of scheduled wage rates.

"Changes in basic wage rate sche ules, moreover, do not reflect the signi cant change which has taken place the composition of the wage structu of industry, and in the hourly earnin of the workers, due to the manner of a ministration of wage rate schedules u der wartime operating conditions. W have concluded, therefore, that chang in basic wage rate schedules do not co stitute the most appropriate measure wage standards in wartime."

AFL members contend "adherence the historical pattern of wage regulati by control of wage rates would ha forced the public members to reco mend a substantial increase in the Lit Steel formula. There is a fundamen defect in the adjusted earnings me ure to which the labor members o ject. Specifically, this average earnin figure represents adjustments in wages

particular individuals, since general wage increases under the Little Steel formula have long been exhausted. However, these average increases to some workers have been charged against all workers."

The public members found that the average cost of living of industrial wage earners and lower salaried employes increased 7.5 per cent from October, 1942, to October, 1944. From January, 1941, to October, 1944, the overall increase was 29.5 per cent. From January, 1941, up to October, 1942, the increase was 20.5 per cent.

Answering labor's argument that general wage rate increases should be made now as an offset against a threatened deflation in the reconversion period, the public members believed that to change the Little Steel formula now would subject all citizens to other and still greater risks. It would bring about fairly rapidly, they contend, a new round of general wage increases throughout American industry and would create such formidable pressure upon prices the whole stabilization program would be jeopardized.

Reconversion Problem Surveyed

It is their contention that an improved standard of living for all our people can come only with a rising volume of civilian goods and services. A level of civilian demand and purchasing power high enough to substantially replace all the present wartime demands of the government is the goal of full conversion to peacetime economy. At that time, the cost of living adjustment of the Little Steel formula will have to give way to wage and price adjustments which definitely raise the general level of real wages. But if action is taken now on wages alone and if price increases were to follow, the public members pointed out, we would have to face the same problems in the reconversion period but at a higher level and with more inequities between various labor groups and among the other segments of society.

Instead of revising the basic wage ceiling, the public members of the board suggested a completely new concept of permanent wage stabilization for incorporation as quickly as possible in the American economic system to prevent inflation after victory in Europe. It was pointed out that minimum rates as prescribed in the Fair Labor Standards act were regarded by Congress as only a beginning and as the most that could be required without causing unemployment. When Congress prescribed a minimum rate of 25 cents an hour for the first year, to be raised during the next five years to not less than 40 cents, that body did not find that these minimum rates were sufficient to afford a decent standard of living, the report said.

The public members of the board suggested consideration of a statutory requirement that "in each industry, minimum rates for a limited number of key occupations above the minimum starting rate should be set, with a view to more effectively correcting substandards of living and, so far as possible, eliminating the minimum starting rate. Peg-points of this sort above the starting rate would not have to be identical for all areas or for all branches of a given industry, and they could be established through industry committees and collective bargaining in the same way as has been provided for in the act with respect to starting rates. These peg-points would constitute a framework within which all intermediate rates would have to be set in accordance with proper job descriptions and evaluations, in balance with each other and with peg-points."

The public members of the board suggested further that these minimum rates be established not only in industries with the lowest wages but in all industries. "The establishment of these minima throughout industry generally, and the consequent revision of ill-defined and unbalanced wage structures," they said, "would provide a very substantial degree of protection against deflation of straight-time hourly earnings in the reconversion period."

Dissension in Ranks of Smaller War Plants Corp. Top Management

S. Abbot Smith resigns from board, criticizing management under leadership of Maury Maverick. Says SWPC has not formulated adequate policies under Surplus Property, Contract Settlement and War Mobilization acts

RIFT, several months in the making in the management of the Smaller War Plants Corp., came to a head recently when S. Abbot Smith announced his resignation as a director of the organization. In a letter to J. A. Krug, chairman, War Production Board, Mr. Smith sharply criticized Maury Maverick as chairman and general manager of the SWPC.

"As a member of the board, 'vested with the management of the corporation,' I have felt responsible for helping the chairman and the other members of the board develop the policies of the corporation and see that they were carried out," wrote Mr. Smith. "However, since that is obviously not the present chairman's interpretation of the responsibilities of the board of directors, I believe that at the present time my interest and energies can be utilized elsewhere more advantageously for the war effort and small business. My personal efforts in the cause of small business are being largely wasted."

Although Congress assigned the Smaller War Plants Corp. important responsibilities under the Surplus Property act, the Contract Settlement act and the War Mobilization and Reconversion act, Mr. Smith said in a statement to the press, the SWPC has not formulated adequate policies under these laws.

In reference to the vital subject of surplus property disposal, he said, "the Smaller War Plants Corp. field offices have had to stumble along with little direction from Washington as to how they should handle this important matter . . . . The Smaller War Plants Corp. must formulate its policy, it must aggressively see to it that small business does have an opportunity to get its share of the surplus items it wants. Big business and speculators are not holding back.

"Last summer and fall the head of the Smaller War Plants Corp. spent weeks visiting Alaska and England. Too much attention is being paid to getting headlines—too little to doing the job."

Mr. Smith declared his criticisms were meant constructively, in order that the SWPC may increase its effectiveness by realizing what its present weaknesses are. There is a real need for the SWPC, he said.

"If small business is to survive," said Mr. Smith, "there must be one agency in Washington whose sole duty it is to represent small business in Washington, to call to the attention of other governmental agencies rules and regulations which may affect small business unfairly, to call to the attention of Congress conditions which may be caused either by the war or by economic forces but which bear unfairly and harshly upon small business and which require legislative remedies, and to furnish such information as will enable the Congress to thoroughly weigh the situation and take such action as it may deem desirable."

Under its present administration, "with little or no regard for the opinions of its board of directors," the SWPC "is beset with confusion and inefficiency because lines of authority are not clearly drawn, the different divisions of the organization are not kept informed of what the others are doing, general policies and programs are not clearly outlined," added Mr. Smith.

"I believe that those interested in the welfare of small business should try to build up strong local associations so that small businessmen may be articulate and make their influence felt. Later I feel sure a plan can be developed so that these

strong local associations can co-operate nationally in working on national issues affecting small business."

Mr. Smith said he will return to his duties as president of the Thomas Strahan Co., Chelsea, Mass. In addition, he said, he will take an active part "in strengthening small business in New England and throughout the country."

In his sixteenth bimonthly report on the activities of the Smaller War Plants Corp., Maury Maverick, chairman and general manager, stated last week that demands for SWPC loans are increasing rapidly. In December and January, 1942, inquiries for loans reflected an increase of 19 per cent above the October-November period. The SWPC is doing an expanding business, Mr. Maverick reported; its loans in the calendar year 1944 came to $197 million, as compared with $58 million from Sept. 1, 1942, to Dec. 31, 1943.

From its two years of experience in making wartime loans to small business, Mr. Maverick reported, SWPC has arrived at these definite conclusions regarding the future:

1. Small business will have a great need for legitimate sound loans which will probably not be supplied by banks or other private institutions, and therefore government credit must be available.

2. In addition, a loan insurance program, on the order of the FHA, should be put into effect to stimulate lending by private banks to small business.

SWPC Has Low Loss Ratio

One reason the banks have been loath to lend to small business, said Mr. Maverick, is the fact that the loans were well in excess of the amount customarily obtained by small business from its local banks. Yet the SWPC has had an extremely low loss ratio, less than 1 per cent.

In many cases, after the SWPC has "broken the ice," local banks have become willing to make loans to small companies. On the whole, however, participation in such business by the banks has been so small, comparatively, as to leave little doubt but that the government will have to continue to make direct loans in order to meet needs during the remainder of the wartime period and in the period of reconversion and peacetime business ahead.

As further evidence that a continuance of government financing of small business will be required, Mr. Maverick cited results of a SWPC survey which, he said, prove that little business on the whole is not prepared for the reconversion period and will need help.

Field representatives of the SWPC reported:

1. Most small manufacturing plants which have obtained war contracts have made money, but a large proportion of those unable to get into war or essential civilian work have suffered and some of them have been forced out.

2. Small plants which have expanded their plants and facilities for war production have done so largely at their own expense.

3. Such small plants with expanded facilities for war work have also found it necessary to carry a much higher than their peacetime volume of raw materials and goods in process which have been obtained primarily through loans which await contract settlement for liquidation.

4. The tax structure and renegotiation provision have borne more heavily on little than on big business, so that "small businesses have been unable to accumulate the reserves necessary to tide them through the readjustment period; in fact, many of these small businesses which have expanded almost violently during the war, to a size all out of proportion to their normal character, in many cases have been renegotiated out of so much working capital that they are in no shape to reconvert without substantial help."

5. A very considerable number of small businessmen are not fully aware of the financial stringency they face nor of the threat to their economic existence. "This is because their current sales volume is very high, the inflow of cash —often through the help of advance payments on war contracts—is sufficient to meet current obligations, and they are using for support operations cash which is owed to the government for taxes and should be reserved for this purpose."

6. Immediately following the end of the war in Europe these small concerns will be shocked into an awareness of their predicament.

The SWPC, Mr. Maverick pointed out, should be given power by Congress to make or guarantee reconversion loans generally.

Another SWPC survey, Mr. Maverick reported, indicates that "small businesses are being swallowed up by big businesses. This trend will be increased by victory and the strategy of big business to get set for peace. Right now and after the war the big companies will have billions of liquid capital that can be used to buy up small companies, like so many bags of potatoes." Unless the government is able to help them with their financial and related problems, concluded Mr. Maverick, many small companies will be literally "forced" out of business.

Mr. Maverick called for a halt, as far as possible, to construction of new facilities for war production. "Nearly everywhere in the country there are small plants with idle capacity," he said.

The SWPC, Mr. Maverick reported, has been called upon by General Hines, the administrator for veteran affairs, to process guarantees on business loans to veterans under the Servicemen's Readjustment Act of 1944. To accommodate the veterans who will want such loans, he said, our economy will have to be increased greatly over any level of the past.

CATHODE RAY TUBE PRODUCTION: These tubes are being produced in quantity by the North American Philips Co. Inc., New York. Operations shown are, left to right: Recording test results; preparing connection wires for loading; using high frequency to heat tube elements to drive off occluded gas during exhausting process; connecting up heater, cathode and other tube elements for test

Owning Agencies Authorized To Sell Surpluses Held Abroad

Army and Navy establish joint organization, called Office of Army-Navy Liquidation Commissioner, to handle growing volume of surpluses in non-combat areas in foreign countries. FEA to continue to dispose of surplus aircraft and components

SURPLUS Property Board has issued Temporary Regulation A, assigning disposal functions in foreign countries to owning agencies. It affects all surplus property abroad, except merchant vessels and naval vessels and was drawn at this time so that the Army and Navy may take immediate steps to handle the growing volume of surpluses in non-combat areas.

The effect of the temporary regulation is to rescind the authority over foreign disposal heretofore in the hands of the Foreign Economic Administration, except for its own property and lend-lease surpluses. The Army and Navy have set up a joint organization called the Office of Army-Navy Liquidation Commissioner to carry out their responsibilities under the new regulation.

Order No. 1 under Temporary Regulation A grants SPB approval to the delegation of authority to this new liquidation commission. If the Army-Navy liquidation commissioner should use surplus property in the settlement of claims, the board has stipulated in order No. 1 that the value of the property so used shall be paid by the Army and Navy into the Treasury Department. The board itself has no authority to settle claims.

It is the policy of the Surplus Property act to prohibit so far as feasible the importation into this country of surplus property sold abroad. The temporary regulation is drawn to carry out this provision with respect to property produced in the United States, but stipulates that it shall not apply where the purchaser certifies that the property will be shipped back to the original manufacturer or will be consigned to some other person or firm in the United States for the purpose of reconditioning for subsequent re-export. Members of the armed forces are allowed to purchase surplus property abroad and bring it into this country for their own use.

In making foreign disposals, the basic stipulated rule is to get the highest net return. The disposal agencies are advised to maintain close contact and cooperation with the United States foreign missions as an aid in carrying out that objective.

The SPB has exempted a number of provisions of the Surplus Property act from the temporary regulation covering foreign disposal.

The temporary regulation provides that proposed foreign sales of plants, pipelines and other installations which cost the government $1 million or more, and patents, processes, techniques or inventions, irrespective of cost, are to be submitted to the attorney general for his opinion as to the applicability of the antitrust laws. Likewise, SPB is also to be informed as soon as negotiations for the disposal of this type of property are started.

The act provides that the board and the disposal agencies shall report to Congress on such surplus property costing over $5 million, with specified exceptions.

Temporary Order No. 1 authorized Metals Reserve Co. to sell for war production aluminum scrap held in its storage facilities under Surplus War Property Administration regulation No. 5 at not less than the minimum price specified in the regulation, plus such amount as may be determined by MRC to compensate for the expense to the government for transporting and storing the scrap.

Temporary Order No. 2 authorized the Procurement Division, Treasury Department, to deposit in a specific account with the treasurer of the United States amounts from proceeds of disposition of property under the Surplus Property Act of 1944 and to withdraw from such account the amounts necessary to make appropriate refunds to purchasers of such property.

Temporary Order No. 3 authorizes any owning agency to lease real property at a fair market rental for the purpose of placing it in prompt use, giving former owners first opportunity to acquire leases.

PRIORITIES–ALLOCATIONS–PRICES

Weekly summaries of orders and regulations, together with official interpretations and directives issued by War Production Board and Office of Price Administration

INSTRUCTIONS

STEEL DRUMS: Alternate quota method of computing the tonnage of new steel drums that may be used to pack the classes of commodities set out in schedule A of L-197 to fill industrial orders in the first quarter of 1945 authorizes the same tonnage as that permitted for the fourth quarter of 1944, including any tonnage increases in the quota authorized in that quarter. Drums authorized for packing commodities listed in schedule B must be excluded. The quota tonnage may not include any unused tonnage of third quarter quota carried over and permitted to be used in the fourth quarter of 1944, nor any tonnage of the first quarter of 1945 quota permitted to be borrowed and used in the fourth quarter of 1944. The alternate quota may not include any tonnage of new steel drums representing a percentage of fiber drums used in 1945, permitted to be used in the fourth quarter of 1944 in addition to that quarter's quota.

Regardless of whether or not the special alternative quota is used, a person may use in the first quarter of 1945, in addition to his regular quota, whatever tonnage is left over from his fourth quarter quota and all or any part of his 1945 permitted tonnage of drums covering the specified percentage of fiber drums used in 1943.

CMP REGULATIONS

CONSTRUCTION: Changes in the construction limitations applicable to authorized building projects have been incorporated in an amendment to schedule A to Controlled Materials Plan regulation No. 6. Revised restrictions are applicable to all construction authorized on form GA-1456 on or after Feb. 17, following approval on form WPB-617. A builder whose authorization was issued before that date may take advantage of any provisions of the amendment.

The amended schedule restricts the use of various fabricated items made of sheet steel and strip; use of fencing, tanks and tank towers; use of metal lath. The use of lead and lead products is prohibited except for certain specified uses. (CMP No. 6).

L ORDERS

PAPER MILL MACHINERY: New parts, as well as complete machines and equipment used in the manufacture of pulp, paper, paperboard and converted paper products, are covered now by restrictions in the paper mill machinery order. (L-83)

USED STEEL RAILS: Sales of used steel rails hereafter must bear a certification that they are to be used for relaying track. No control has been established over relaying rail when used as such on the owner's lines. (L-88)

POWERCYCLES: In making repair and replacement parts, except engine parts, for motor bikes, motor scooters, motor glides and other types of powercycles (not including motorcycles) for nonmilitary use, manufacturers are permitted to use, per quarter, as much metal, by weight, as they used for the same purpose in the fourth quarter of 1944. (L-301)

PRIORITIES REGULATIONS

SPOT AUTHORIZATION: Spot authorization of civilian production that is not prohibited or limited by an L or M order of the WPB is now permitted. Appeals under orders that are subject to the spot procedure are permitted. (PR No. 25)

PRICE REGULATIONS

BUILDERS' HARDWARE: A jobber's markup on new types of builders' hardware or insect screen cloth first offered for sale by him after March 3, 1945, is limited to 33 1/3 per cent applied to the manufacturer's maximum price of the product, plus actual transportation charges by the jobber for delivery. Manufacturers of new models of builders' hardware products or insect screen cloth must notify all purchasers in writing of the producers' maximum prices for the new products. (No. 40)

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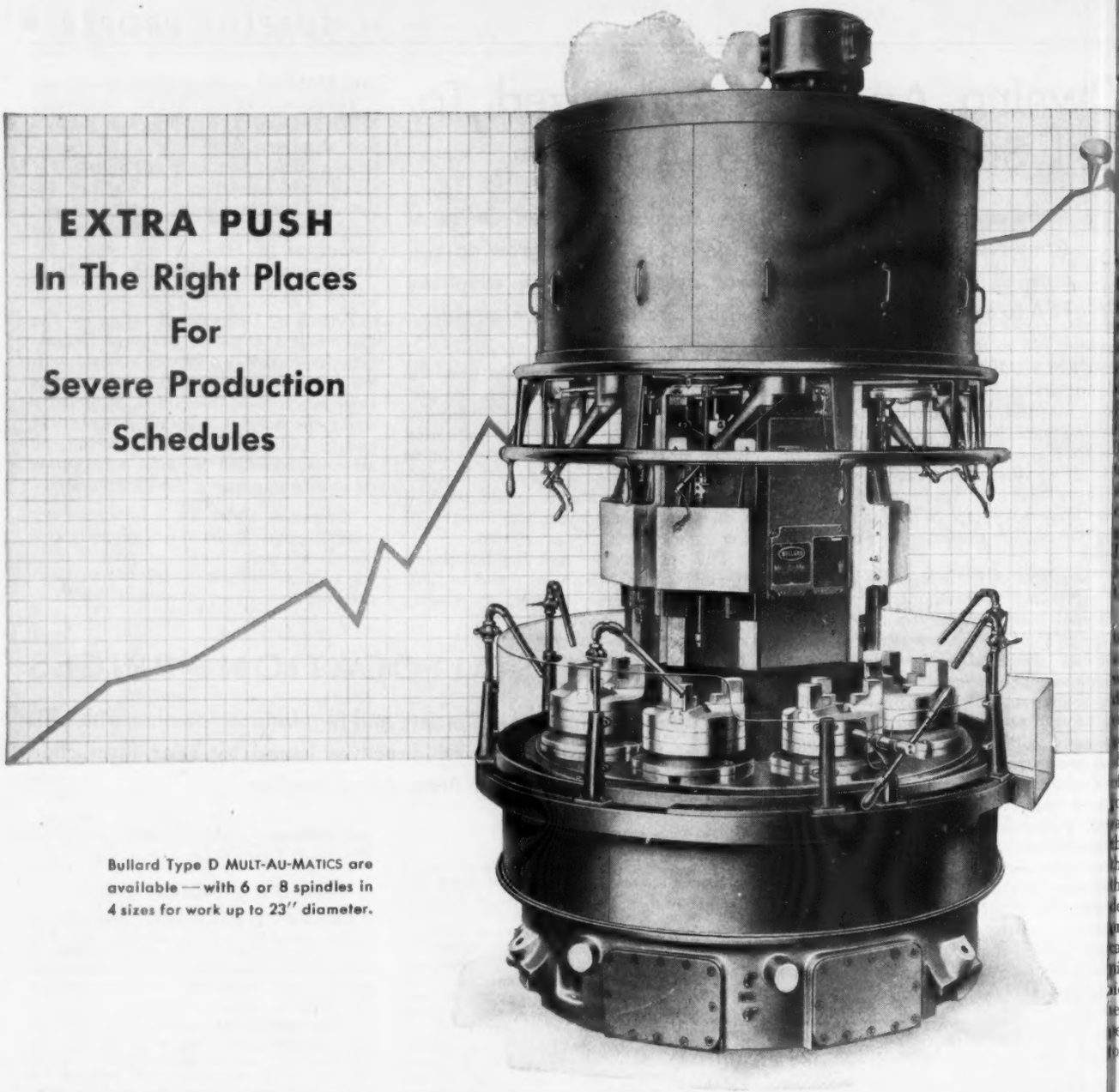

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BULLARD

CREATES ***NEW METHODS*** TO MAKE MACHINES DO MORE

By A. H. ALLEN Detroit Editor, STEEL

MIRRORS of MOTORDOM

Dodge strike evidence of growing intent of union to muscle into control of production schedules and plant discipline. More than 13,000 leave jobs when seven are discharged for slowing down production of war items

DETROIT

CORROBORATIVE evidence of the UAW-CIO's growing intent to muscle into control of production schedules and war plant discipline is the only conclusion to be drawn from the shocking strike of 13,500 employes at the Dodge main division of Chrysler Corp. which began Feb. 23 and at this writing is still in full force. The plant's production is 38 per cent engines for light and heavy trucks, tank transmissions and rocket shells, 10 per cent Navy Bofors antiaircraft guns, and 22 per cent aircraft engine parts, the latter furnished to the Dodge Chicago plant division of Chrysler which builds Wright engines used in the B-29 bomber.

Despite all denials of the union, there is ample proof that the walkout was carefully engineered in all its stages, with probably no more than a few hundred taking any aggressive parts. Difficulty began in a department processing gears for the aircraft engine, where total shift employment was 734. One group of machines finishes the fuel pump gear for the engine, and each machine has a rated capacity of 225 gears per 8 hours, the operator's sole task being to load the work, start the machine and unload the piece when it is finished. It was determined by the company a fair rate of production, commensurate with machine capacity and urgency of the job, was 184 pieces per shift. Seven operators decided otherwise, and agreed among themselves to handle only 150-155 pieces per shift, stalling and loafing long enough to draw out the schedule to this extent.

Men Discharged After Warning

After a warning by the management, the men refused to alter their rates and were discharged for loafing and insubordination. This was on Thursday evening, Feb. 22. Early Friday morning, several hours before actual trouble at the plant, several calls were received at Chrysler executive offices from local newspapers inquiring about a strike at Dodge. At the time no interruptions had occurred at the plant and the newspapers were so informed, whereupon company spokesmen were told a strike was going to be called. At mid-morning, the 734 in the gear department left their jobs, then 725 in another department, then 2000 in another, then 1500 more, then 2600, until by noon 7000 were out and at the end of the day shift 9000. Only a small portion of the afternoon shift reported for work and by Saturday morning the entire plant was down and a picket line of 700 marched around the gates. On Monday even power plant and maintenance employes left their work.

Meanwhile, the walkouts spread to Chrysler interplant truck drivers who handle movement of parts and material between the various plants in the Detroit area. Only 18 out of 100 on the day shift came to work Saturday, and only 7 of 54 on the second shift. After one driver was waylaid and beaten up, those who had reported left and all interplant truck movements were stopped.

By Tuesday, the flow of engines to the Dodge truck plant had been curtailed to the point where 3000 had to be sent home, leaving 600 on the job. This was the first immediate effect on other Chrysler divisions, but it was expected that continuation of the Dodge walkout would shortly interrupt operations at other plants, with the eventual possibility 100,000 might be idle.

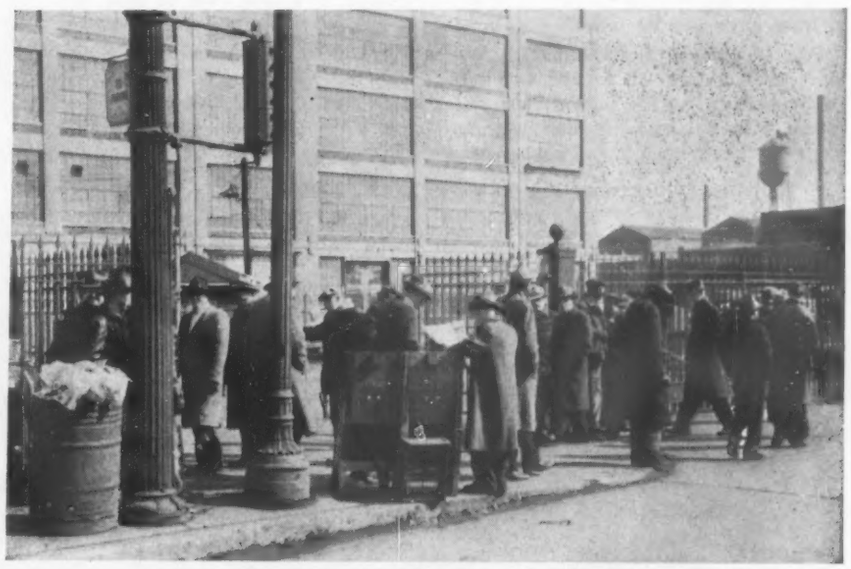
Ignored WLB Orders

The regional War Labor Board lost no time in summoning company and union representatives for hearings, and several orders were issued for the strikers to return to work, but they were ignored. The union scheduled several mass meetings to discuss the situation. The first was attended by several hundred and resulted in nothing more than extended haranguing and sporadic fisticuffs. The curious charge was aired by one "hot-head" that Chrysler was proceeding with conversion to automobile production in the Dodge plant and had cleared two floors of the plant for this purpose. This was a ridiculous allegation, inasmuch as Dodge officials in recent months have been working overtime to bring new war production jobs into the plant; in fact, the very department which first went on strike owed its existence only to the determined efforts of the management to pry the work loose from the Dodge Chicago plant.

Union Ignored Grievance Procedures

The union is obviously without a leg to stand on, since it ignored established grievance procedures set up in the contract with the company. International officers of the UAW-CIO made public efforts to persuade the men to return, but were shouted down in the attempt. Leaders of the Dodge Local No. 3 declared the men would not resume work until the seven discharged men were reinstated, but this position is untenable if grievance procedure and union contracts are anything more than a scrap of paper.

For its part, about all the Chrysler management can do is sit back and wait to see what happens. It is on solid ground in demanding the right to determine fair production schedules and to retain disciplinary control of its working force. It is to be hoped this right will be insisted upon firmly, not only in the interest of Chrysler but of practically all employers who are currently meeting the same difficulties from unions. Everywhere the reports are the same—soldiering on the job, physical



Pickets ring the Dodge main plant in Detroit during a strike resulting from the discharge of seven employes for slowing down war production. About 13,500 engaged in the production of truck engines, transmissions, antiaircraft guns, parts for B-29 engines and other critical war items were made idle by the walkout. NEA photo

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and vocal attacks on all forms of supervision, refusal to meet even minimum standards of production, absenteeism beyond all reason. The case is cited of one small company here which faced a labor dispute because of disciplinary action taken against three employes for excessive absenteeism, one of whom was away from his job for 365 working days out of the last 900.

Union leaders in the Dodge walkout have hinted they would like the Army to move in and take control of the plant. They are taking this tack after observing what developed when the Army took control of the Montgomery Ward stores here, yielding to demands for back pay and reinstatement of troublemakers. But running a couple of retail stores is something different from running a complex industrial machine like the Chrysler Corp. and about all the military could do would be to deputize the present management to continue operations, with an Army officer in "token" control.

Case Study for Senate Committee

The Dodge shutdown was the most serious interruption, in point of numbers involved to hit the local headlines in many months, and made an interesting case study for the Senate's Mead War Investigating Committee now meeting here. Perhaps that is one explanation for the walkout. There are indications not much important testimony had been supplied by plants here on the score of declines in man-effort, for the reason that managements, in the face of a touch-and-go labor situation, are fearful of submitting supporting data which might immediately set off strikes in their plants, and might even be made the case for prosecution under the Wagner act.

War supply and facility contracts continue to pour into this area, now aggregating better than a billion dollars since Jan. 1. In two months, half as many contracts have been approved as were approved for all of last year, many being for projects which will not start for several months. Among the larger placed in the past three weeks are:

To Chevrolet, $112,000,000 for aircraft engines and parts.

To Chrysler, $33,000,000 for B-29 components.

To Chrysler, $17,000,000 for trucks, and $1,600,000 for 40-millimeter gun barrel assemblies.

To Ford, $13,000,000 for aircraft engine spare parts, $1,915,376 for aircraft generators and $1,068,000 for squad tents, latter to be produced at Highland Park plant.

To Detroit Brass & Malleable Works, $2,413,340 for 75-millimeter shell cases.

To Detroit Diesel Division, two contracts totaling about $11,700,000 for medium tank parts.

To F. L. Jacobs Co., $2,233,660 for aircraft bombs.

To Lyon Inc., $8,544,000 for 40-millimeter cartridge cases.

To Graham-Paige, $5,096,597 for spare parts for LVT landing craft.

To Parker Wolverine Co., $2,140,000 for camouflage netting.

To Plan-O-Mill Corp., Carboloy Co. Inc., Frederick Colman & Sons, LeMaire Tool & Mfg. Co. and Detrex Corp., under a pooling arrangement, $979,000 for a variety of machines and tools.

Among construction and facility contracts recently approved are: $1,641,000 for one-story building to be operated by Kelsey-Hayes Wheel Co. for production of 107 different parts required in the M-24 (Cadillac-built) light tank, and $1,119,000 for a one-story addition to existing buildings at Midland Steel Products Co., to produce what is described as a new type of tank.

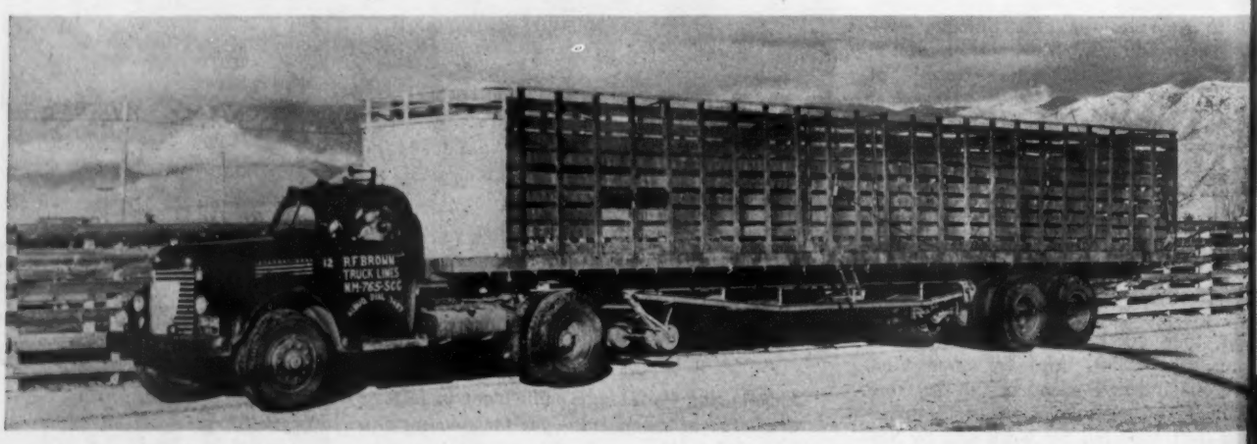
Secretary of the Treasury Henry Morgenthau tossed out what he doubtless thought would be a nice sugar-coated plum for industry executives in a recent speech here when he forecast an export market for automobiles amounting to 1,000,000 units per year, contingent upon ratification of the Bretton Woods monetary agreements. He argued that stabilization of currencies would permit foreign buyers to be assured of prices to be made for automotive products, irrespective of fluctuations in exchange rates, and which would permit payments "in American dollars instead of harmonicas."

His thesis sounded to many like a whistle solo in the dark for obvious foreign buyers, regardless of currency stabilization, are going to need some currency, which they now sadly lack if they are to buy American motor cars. Lacking currency, about all they can offer are the products of their own manufacture or agriculture, or, in a word, harmonicas.

Export Prospects Not Promising

Best export year the motor industry ever experienced was 1929 when 451,095 passenger cars and 282,667 trucks were sold abroad. This was 13.2 per cent of total production and was a miraculous export business, with nothing like it before or since. Over the past few years automotive exports have dwindled steadily, and with probably half a million motor vehicles, mainly trucks, of course, lend-leased to Europe, it seems hardly likely any major export market will develop inside of the next five years particularly when consideration is given to the ravaged industry and economy of the continent. Furthermore the age-old high tax policy of European countries on motor cars precludes the sale of many high-horsepower U. S. vehicles. As for Mexico and South America, the prospects there for export sales may be somewhat brighter, at least they are so regarded by the automobile producers here.

Ford will start production, probably about July, in its Somerville, Mass. plant on contract for 10,000 amphibious cargo carriers of the M-29 variety.



CATTLE TRAILER: This 45-foot Fruehauf tandem-axle unit, hauled by an International tractor, is used to haul cattle from Cimarron, N. Mex., to the Santa Fe railroad at Raton, N. Mex., 50 miles of hazardous mountain driving at elevations of from 6000 to 7000 feet. The livestock trailer, one of the largest in the world, has an overall length of 59½ feet, can carry 61 head of cattle

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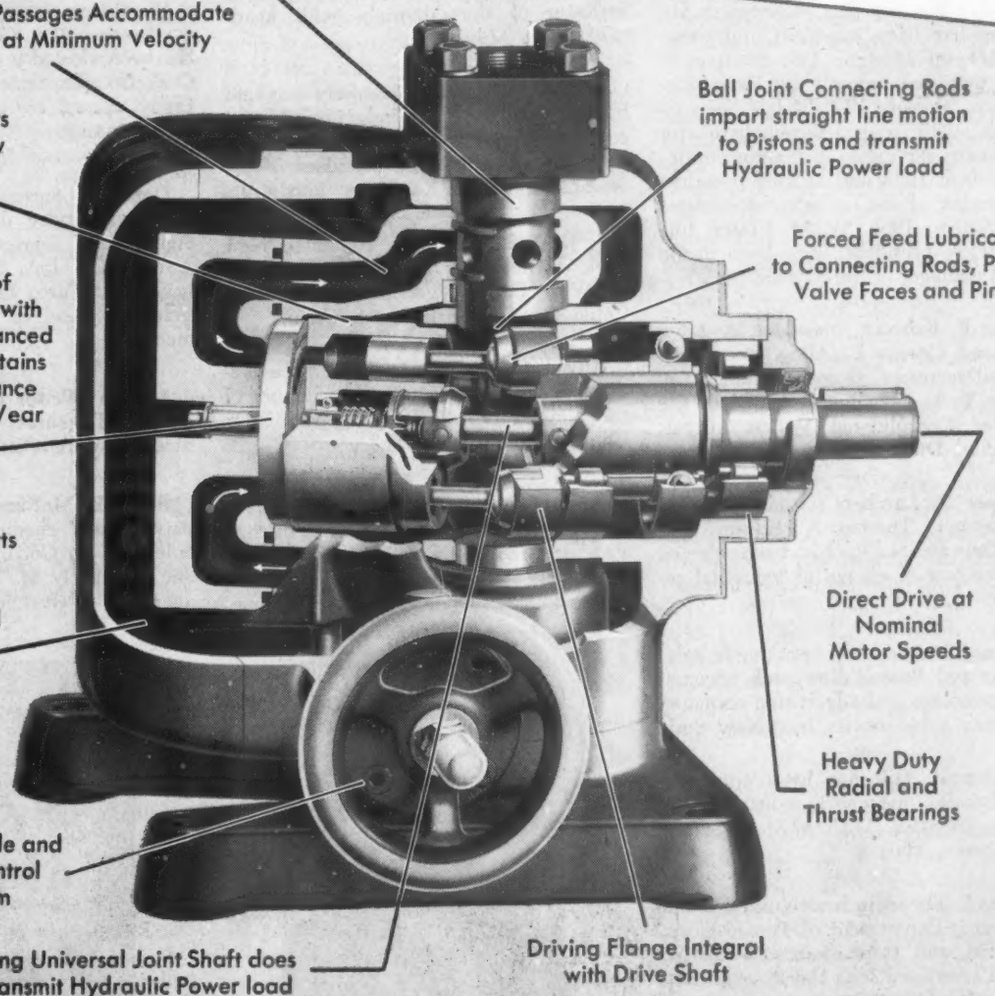
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MEN of INDUSTRY

FRANKLIN R. HOADLEY

CARROLL B. MERSHON

Franklin R. Hoadley has been elected president, Farrel-Birmingham Co. Inc., Ansonia, Conn., succeeding **John W. Haddock**. For the past eight years Mr. Hoadley has been president and treasurer, Atwood Machine Co., Stonington, Conn., acquired recently by Farrel-Birmingham. Prior to 1936 he had been associated with Farrel-Birmingham for many years, serving as a director continuously since 1923 and as vice president and member of the executive committee from 1930 to 1936. **W. M. Fraser,** formerly vice president, has been made general manager of the Atwood plant.

—o—

Irving B. Babcock, president, Aviation Corp., and **George E. Allen,** vice president and secretary, Home Insurance Co. of New York, have been elected to the board of Consolidated Vultee Aircraft Corp., San Diego, Calif.

—o—

Sumner F. Larcher, formerly personnel manager, Thomas A. Edison Inc., West Orange, N. J., has been elected vice president in charge of industrial relations.

—o—

Howard Halmes has been made sales manager and **Russell Newcomb** becomes sales promotion and advertising manager, Simmonds Aerocessories Inc., New York.

—o—

William R. Hill has been appointed general sales manager, industrial and commercial sales, Warren Steam Pump Co., Warren, Mass.

—o—

James J. Theodore has returned to the engineering department of Pemco Corp., Baltimore, and **Capt. James Willis** has become associated with the Research and Engineering Division.

—o—

T. B. Martin has become director of advertising for both the Detroit and Milwaukee electrical divisions of Square D Co. **Dwight A. Roehm** continues as advertising manager, Detroit Division, and **Clifton Carr** continues as advertising manager, Kollsman Division. **Frank Roby,** who left the Industrial Controller Division in 1942 to enter the armed services, has rejoined the company as sales manager of that division, with headquarters in Milwaukee.

—o—

Carroll B. Mershon, formerly manager of industrial sales, Manufacturers Light & Heat Co., Pittsburgh, has been appointed assistant to the president, Pennsylvania Industrial Engineers, Pittsburgh.

—o—

J. J. Walsh has been appointed New York district sales manager, Page Steel & Wire Division, American Chain & Cable Co. Inc., Bridgeport, Conn.

—o—

Alfred G. Mohrman, formerly assistant manager, has been made manager of the New York office, Bridgeport Brass Co., Bridgeport, Conn.

—o—

A. S. Vandervoort Jr. has been made sales manager, Mid-Continent district, Pittsburgh Steel Co., Pittsburgh, and will make his headquarters in Houston, Tex. **S. E. Elder** is assistant sales manager of the district, with headquarters at Tulsa, Okla. Other appointments include: **Paul R. King,** sales representative, Tulsa, and **George W. Novak,** chief engineer, Mid-Continent district, Houston.

—o—

William E. Ireland has been appointed manager of passenger car tire and tube sales, Tire Replacement Division, B. F. Goodrich Co., Akron, O.

—o—

Charles H. Brown, until recently a member of the purchasing department, Lukens Steel Co., Coatesville, Pa., has retired after 49 years service with the company.

—o—

Albert M. Hall, formerly research metallurgist with International Nickel Co. Inc., New York, has been appointed to the staff of Battelle Memorial Institute, Columbus, O.

—o—

W. Gibson Carey Jr., president, Yale & Towne Mfg. Co., Stamford, Conn., has been elected a director of Armstrong Cork Co., Lancaster, Pa., to fill the vacancy caused by the death of Dwight L. Armstrong.

—o—

Donald S. Sprague, formerly manager, customer service department, and Foreign Field Service Division, Douglas Aircraft Co. Inc., Santa Monica, Calif., has joined Turco Products Inc., Los Angeles, as head of the aviation department.

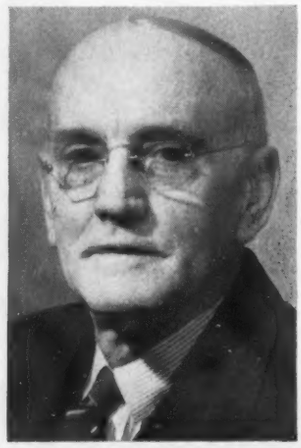
—o—

J. T. AuWerter has been made president and general manager, Cuyahoga Steel & Wire Co., Cleveland.

—o—

Ralph B. McKinney, general manager, papermakers' chemical department, Hercules Powder Co. Inc., Wilmington, Del., and **Dr. Wyly M. Billing,** general manager of the synthetics department, have

RAYMOND D. DWYER



JACOB C. WILKINS

Mr. Dwyer has been appointed superintendent of the steel production department, and Mr. Wilkins is superintendent of central mills, Gary works, Carnegie-Illinois Steel Corp., Chicago, reported in STEEL, Feb. 19, p. 95.

been elected company directors. They succeed **Charles C. Hoopes** and **George M. Norman,** both of whom are retiring after 32 years of service.

—o—

John W. Kirschmer, formerly sales representative in Cleveland for Radio Corp. of America, New York, has been named sales representative in the equipment sales section for the eastern district.

—o—

P. J. Degnon, vice president, Mack-International Motor Truck Corp., Long Island City, N. Y., has been appointed manager of the corporation's New England Division.

—o—

Benjamin Ashton, formerly vice president and chief engineer, Electrol Inc., Clifton, N. J., has been elected president, succeeding **Ray Criddle,** resigned.

—o—

George C. McMullen has been appointed vice president in charge of product research and development and assistant to the president, Tyson Bearing Corp., Massillon, O., and **Harry L. Vines** has been named director of sales.

—o—

William H. Safranek Jr. has been appointed to the staff of Battelle Memorial Institute, Columbus, O., where he will be engaged in Electrochemical research.

—o—

Niles Trammel, president, National Broadcasting Co., has been elected a director of Radio Corp. of America, New York, succeeding **Gen. Charles G. Dawes,** resigned.

—o—

Harold W. Kealey has been appointed director of personnel, Elliott Co., Jeannette, Pa., in addition to his duties as assistant secretary.

—o—

Gwilym A. Price, vice president, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and **John R. Read,** president, Canadian Westinghouse Co., Hamilton, Ont., have been elected directors of Westinghouse Electric & Mfg. Co.

—o—

Seven employes of the East Pittsburgh plant of Westinghouse Electric & Mfg. Co. to receive the company's Order of Merit are: **Dr. Charles F. Engel,** assistant medical director; **Edgar C. Barnes,** industrial hygiene engineer; **George Allen Moore,** section engineer; **W. Allen Brecht,** manager of transportation engineering; **August Heckman,** works engineer; **C. C. Whittaker,** section engineer, and **C. F. Jenkins,** engineer.

—o—

The following have joined Titanium Alloy Mfg. Co., Niagara Falls, N. Y.: **Dr. Carl Curtis; Ernest H. Wyche,** metallurgical engineer; **J. S. Geiger,** research associate; **Robert Anibal** and **Sarkis Saryan,** analytical chemists; **A. R. Fowler,** chemical engineer; **Gilbert H. Jeffery,** field development engineer in the New York district, and **Ross G. Harrison Jr.,** sales development engineer.

FRANK T. BUMBAUGH

COL. O. K. GRAEF

Changes within the company include: **Leonard G. Renouf,** superintendent of refractory production; **Karl B. Thews,** manager of sales; **Jack G. Merriam,** sales representative in the Detroit area with headquarters in Toledo, O.; **Harold D. Prior,** manager of the New York sales staff, and **John R. Lewis,** member of the sales department, Pittsburgh territory.

—o—

Frank T. Bumbaugh has been named manager of sales, Alloy Division, Carnegie-Illinois Steel Corp., Pittsburgh, succeeding the late Frank L. Gibbons, whose assistant he has been for the past three years.

—o—

Lt. William E. Harding, since December, 1942, attached to the Naval Intelligence Service, has returned to his former post as Ohio-Michigan assistant regional director of the Wage-Hour and Public Contracts divisions, U. S. Department of Labor.

—o—

A. R. Nordone has been appointed western New York sales representative, Paisley Products Inc., New York. Previously Mr. Nordone served 14 months with the Army Air Forces.

—o—

John P. Johnston has joined Weatherhead Co., Cleveland, as refrigeration engineer for the West Coast office in Glendale, Calif.

—o—

H. F. Seymour has been made president, Columbian Vise & Mfg. Co., Cleveland, **Dan C. Swander** is chairman, **Dan C. Swander Jr.** becomes vice president, and **A. R. Munhall** has been elected secretary-treasurer.

—o—

Howard F. Aldrich has been named assistant factory manager of the St. Paul branch of Fruehauf Trailer Co., Detroit.

—o—

Delos R. Hay has been elected president and treasurer, A. T. Wagner Co., Detroit, succeeding the late T. W. Kirby.

—o—

Dr. Lucas P. Kyrides, research director of Monsanto Chemical Co.'s Organic Chemicals Division, has received the first Midwest Award of the American Chemical Society, to be given each year by the Society's St. Louis Section for "meritorious contribution to the advancement of pure or applied chemistry or chemical education."

—o—

Col. O. K. Graef, retired from the Army in November, 1944 to inactive duty status, has resumed his former association with the Bearings Division, Joseph T. Ryerson & Son Inc., Chicago. He is in charge of West Coast sales of Ryertex non-metallic bearings and Glyco babbitt metals, with headquarters in Los Angeles.

—o—

E. E. Ellwood has been appointed assistant district sales manager in St. Louis, and **J. P. Feagley** becomes assistant district sales manager in New York for Youngstown Sheet & Tube Co., Youngstown, O.

—o—

D. J. Richards, previously assistant director of sales, has been elected vice president, sales, E. F. Houghton & Co., Philadelphia, manufacturers of oils, leathers and metalworking products.

—o—

R. J. Heggie has been named secretary, A. M. Castle & Co., Chicago, to succeed **J. J. Fountain,** who is being transferred to the company's Los Angeles branch.

—o—

John D. Homan, 714 South Orleans avenue, Tampa 6, Fla., has been appointed regional sales representative by Stearns Magnetic Mfg. Co., Milwaukee.

—o—

Corbet L. Drewry has been appointed an assistant co-ordinator of controls, Canadian Department of Munitions and Supply, Ottawa.

—o—

John J. Brodak, foundry technician and assistant superintendent, Swedish Crucible Steel Co., Detroit, has been appointed foundry superintendent.

—o—

W. E. Fry has been named manufacturer's representative for Eclipse Counterbore Co., Detroit, in the west Missouri

and Kansas area. Mr. Fry succeeds **B. C. MacDonald.**

—o—

Lucien Moore, an executive of Crane Co., Chicago, is on leave for a few months on a special assignment for the War Department.

—o—

Harold O. Washburn, formerly vice president, becomes president of American Hoist & Derrick Co., St. Paul, succeeding **Frederic Crosby,** who has been elected to the newly-created post of chairman. **Rolf E. Ljungkull** becomes vice president of engineering, **Donal B. Botkin** has been appointed vice president of manufacturing, **Stanley M. Hunter** has been made vice president of sales, and **James F. Bishop** is secretary and assistant treasurer.

—o—

John Atkinson has been made manager of the Buffalo plant of Westinghouse Electric & Mfg. Co., succeeding the late Harry Macy.

—o—

Wallace F. Ardussi has been elected vice president, Hupp Motor Car Corp., Detroit. Mr. Ardussi will direct the company's sales organizations at both the Globe Stamping Division, Cleveland, and the Hupp Machining Division, Detroit. He also will be in charge of engineering research and development activities of both divisions.

—o—

P. V. Armstrong has joined the Martins Ferry Division, Blaw-Knox Co., Pittsburgh, as chief manufacturing engineer.

—o—

Alton Parker Hall has been appointed general manager of sales, American Chain & Cable Co. Inc., Bridgeport, Conn., with headquarters at 230 Park avenue, New York.

OBITUARIES . . .

Henry S. Evans, 61, since 1941 president of Central Iron & Steel Co., Harrisburg, Pa., died in a hospital in Harrisburg Feb. 24. He had been associated with the company since 1915, prior to which time he had been associated since 1907 with the Cambria Steel Co. When he joined Central in 1915 Mr. Evans was appointed superintendent of the plate mill. In 1923 he was named general superintendent, in 1939 was elected vice president and chief executive officer, and in 1941 became president and chief executive officer. He was a member of the American Iron and Steel Institute and the American Society of Mechanical Engineers.

—o—

Carl M. Beattie, general manager, Lake City Malleable Co., Cleveland, died Feb. 28 in that city. Mr. Beattie came to Cleveland in 1936 from Buffalo where he had been president of Jewell Alloy & Malleable Co. for eight years.

—o—

Harrison Archibald Mayse, 71, vice president and treasurer, H. O. Canfield Co., Bridgeport, Conn., died Feb. 19 in Southport, Conn. He had been associated with the Canfield company 44 years.

—o—

Frank C. Huston, 48, sales representative of the Greer Steel Co. and the Reeves Steel & Mfg. Co., Dover, O., died there Feb. 20.

—o—

Herbert C. Comstock, 76, who retired three years ago as president and owner of the Steel Protector Corp., manufacturer of rustproof undercoating for metals, died Feb. 20 in Mt. Kisco, N. Y.

—o—

Frederick L. Ambach Jr., president of the American Iron-Steel Mfg. Co., Wellston, Mo., died Feb. 16 in Clayton, Mo.

—o—

Ralph Stoddard, 75, chairman and director, DeLaval Steam Turbine Co., Trenton, N. J., and president and treasurer of the DeLaval Separator Co., New York, died Feb. 20 in New York. He also was president of DeLaval Pacific Co., San Francisco, and chairman of DeLaval Co. Ltd., Peterborough, Ont., Canada. Mr. Stoddard, who joined DeLaval in 1907, was instrumental in applying the principle of centrifugal separation, first used to separate cream from milk, to a variety of industrial uses.

—o—

Bertram B. Quillen, 75, president, Cincinnati Planer Co. and Acme Machine Tool Co., both of Cincinnati, died there Feb. 26.

—o—

Frank A. Frey, 56, president and treasurer, Geuder, Paeschke & Frey Co., Milwaukee, died Feb. 21 in that city. Mr. Frey's father, the late Frank J. Frey, had been one of the founders of the company in 1882.

—o—

Benjamin Nields, assistant vice president of National Malleable & Steel Castings Co., Cleveland, died Feb. 26 in that city. Mr. Nields had been in charge of the company's department of railway sales.

—o—

William H. Ridgway, 88, president, Craig Ridgway & Sons Co., Coatesville, Pa., died there Feb. 20. He had been associated with the company, which was founded by his father, throughout his entire business career.

—o—

Dennis L. O'Neil, 69, a superintendent of the Cyclone Fence Division, American Steel & Wire Co., Chicago, died Feb. 18 in Waukegan, Ill. He had been employed by the company 44 years.

—o—

Edgar A. Simmons, 84, president, Superior Machine Tool Co., Kokomo, Ind., died Feb. 23.

—o—

Ellwood M. Rowand Jr., mechanical engineer for E. I. du Pont de Nemours & Co. Inc., Wilmington, Del., died Feb. 21 on a train enroute to Chicago.

—o—

Albert Sydney Bonner, 53, president, Clark Equipment Co., Buchanan, Mich., died there Feb. 8. Mr. Bonner had been associated with the Clark company since 1915.

—o—

W. B. Hoffman, traffic manager, Alan Wood Steel Co. and Rainey-Wood Coke Co., Conshohocken, Pa., died Feb. 23.

—o—

William J. Higginson, 57, structural engineer and partner in Higginson-Johnstone Co., New York, died Feb. 26 in Rockville Center, N. Y.

—o—

Max Sontag, 70, owner of the Broadway Sheet Metal Co., Cleveland, died Feb. 27 in that city.

—o—

William A. Notman, 82, organizer of McKinnon Dash Co., died in Buffalo Feb. 22. He was vice president and secretary of McKinnon Dash 39 years.

—o—

Andrew C. Perkins, president, Georgia Iron Works, died recently in Augusta, Ga.

—o—

J. Scott Parrish, 75, president, Richmond Foundry & Mfg. Co., Richmond, Va., died there recently.

—o—

Paul Krone, 69, president, Paul Krone Die Casting Co., Chicago, died Feb. 21 in Milwaukee.

—o—

John A. Saunders, 47, sales manager for the Cadillac Motor Car Division of General Motors Corp., New York, died there recently.

—o—

John F. Nelson, 55, who retired in 1943 as auditor of Wisconsin Steel Co., division of International Harvester Co., Chicago, died Feb. 23 in Lake Worth, Fla.

—o—

Albert C. Paul, 71, advertising director of National Brake & Electric Co., Milwaukee., from 1910 until his retirement in 1930, died Feb. 25 in Milwaukee.

—o—

John C. Herr, 51, chief metallurgical engineer, Indiana Harbor Works, Youngstown Sheet & Tube Co., East Chicago, Ind., died Feb. 24 in Chicago.

Committee Plans To Compile Data On Steel Prices

Pacific Coast industrialists pushing program designed to strengthen area's position as postwar steel center

LOS ANGELES

PACIFIC Coast industrialists have announced the shaping of a three-point program aimed at seeking a cheaper and more abundant supply of steel to further the West's economic growth.

The triple-phase plan as laid down by Kenneth T. Norris, president, Norris Stamping & Mfg. Co., Morris B. Pendleton of the Plomb Tool Co., and Alden Roach, head of Consolidated Steel Corp., leading figures on the all-western steel committee formed at the recent Salt Lake City conference, includes:

1. Compilation of data on supplies and prices of steel in the West.
2. Organization of western steel buyers into a single working group for a study of prices and supplies.
3. Regularly held discussions with steel producers on the subject of delivered steel prices.

Bethlehem Steel Acquires Oil Field Equipment Firms

Bethlehem Steel Co., Bethlehem, Pa., has acquired all stock of Petroleum Equipment Co. and Petroleum Equipment International, both California corporations. Operations will continue under these names. No announcement was made of consideration paid.

Bethlehem plans to expand Petroleum Equipment Co. with emphasis on refinery and oil field drilling equipment. General offices and principal warehouse of the two Bethlehem subsidiaries will continue in Vernon, Calif., with Petroleum Equipment International continuing its office in San Francisco.

Simpson Steel Actively Engaged on War Work

LOS ANGELES

R. N. Simpson and A. F. Simpson Jr., who acquired the Davenport Mfg. Co. and reorganized the company as the Simpson Steel Co., 3700 E. 26th street, in 1942, report current war work done by the company is on contracts direct from the Maritime Commission. It also is one of the largest fabricating subcontractors for the Consolidated Steel Corp. on ship orders. The firm, employer of 33 people in 1941, now employs 668.

IGNORE PICKETS: Despite a strike and picket line at the Todd Pacific Shipyard at Seattle, nonstriking workers ignore pickets as they report for work as usual. NEA photo

Bethlehem Steel's Pacific Coast Veterans Program Gets Started

SAN FRANCISCO

VETERAN'S employment and rehabilitation program at Bethlehem Steel Co.'s San Francisco shipyard will get under way with appointment of Capt. Gerald M. Sieben as veteran counsellor, W. M. Laughton, general manager, announced.

The San Francisco yard has to date either re-employed or newly hired 2280 discharged veterans, records show, while the company in all its operations including steel plants, works, mines and shipyards, had hired over 16,000 returned veterans by the beginning of December. More than 5500 had been with the company before entering the service.

Under Captain Sieben's guidance, veterans seeking employment at the San Francisco yard will have the benefit of the veteran employment procedure.

This includes accurate records of individual cases and consultations to determine the suitable occupation for the applicant, finding proper jobs for handicapped veterans and training.

It also calls for exploration of the veterans' capabilities with a view to their advancement, personal follow-up of all veterans with regard to their adjustment to civilian life, and constant advice on benefits accruing under various government agencies.

Veterans formerly in the company's employ who are discharged or about to be discharged from the service are sent a letter inviting them to apply for employment within 90 days—in accord with legal provisions—after leaving the service. Bethlehem then notifies the veteran's draft board of his re-employment.

In addition to jobs for returned veterans, the company will, through its veterans' counsellor, give special consideration for employment of women whose husbands are in military service, whose husbands or fathers have been killed in military service, or who will be assuming substantial financial obligations for the support of husbands or fathers incapacitated while in military service. Similarly special consideration will be given applicants for employment who are supporting incapacitated veterans or their families.

Captain Sieben, the newly appointed counsellor, saw service both in the first World War and in the present war. His last assignment was as officer-in-charge of civilian censorship in New Caledonia, South Pacific.

The comprehensive employment procedure under which he will work was announced recently by E. G. Grace, president, Bethlehem Steel, who said: "Our program aims to give attention to each individual's problems. We are not forgetful of the sacrifices made by those who have suffered severe disabilities during the war and measures looking to the rehabilitation of the handicapped are, of course, part of our program."

WING TIPS

Spare parts, equivalent to 1000 whole B-24 bombers, produced at Ford's Willow Run plant. Produced and assembled along with the regular flyaway bombers, the spares are shipped and flown all over the world

EXTENT of spare parts production in aircraft manufacturing is shown by figures released from the Ford Willow Run bomber plant which indicate the equivalent of better than 1000 B-24 Liberator bombers already has been built in spare parts. Produced and assembled along with regular flyaway bombers, the parts are shipped and flown all over the world through the 831st AAF specialized depot at Shelby, O. The Willow Run plant is the source of most of the spare parts required by B-24s in the field.

Current schedules call for an equivalent of one extra bomber in spare parts for every seven completed ships. In addition to handling 70 per cent of all spare parts requirements, Willow Run handles 85 per cent of all emergency requests, the latter often flown from the plant direct to the battle front. Speed of handling such requests is shown by a recent order received late on a Saturday afternoon, which was on its air way by midnight and on Tuesday morning was in England ready for installation.

Quantity of each part or assembly to be produced is determined by a "part fatality record," which tabulates the frequency of requests for specific parts. A daily shipment goes to the Shelby depot, where requests are received and screened to determine the parts needed. At one time emergency requests ran as high as 100 orders a day, but many have been eliminated by observing fatality trends and shipping the parts before they are needed. Rush orders usually are for small parts, but occasionally such items as a fuselage bottom panel, landing gear or empennage assembly are included.

Early attempts to keep a supply of spare parts on hand in the field were complicated by the frequency of design changes, numbering about 400 a month; hence supplies of these parts are now funneled from manufacturing and assembly lines at Willow Run and shipped to the depot, export-packed by units to expedite overseas shipment and to avoid repacking.

7013 Civilian Type Planes Sold from Surplus Stock

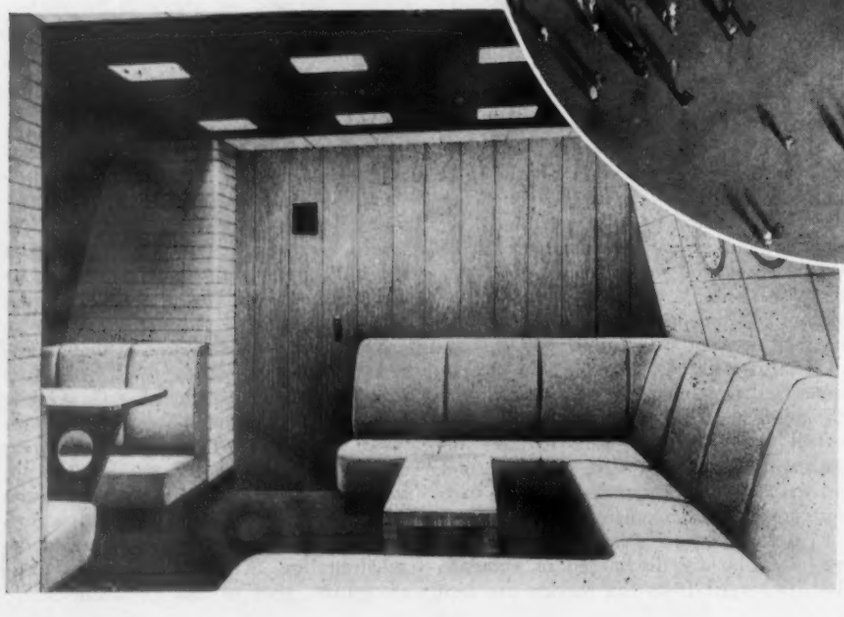
Sale of 7013 civilian type airplanes out of a total of 10,180 declared surplus had been made to Feb. 1, the Surplus Property Board announced last week.

In January, 459 civilian type planes were sold, compared with 861 declared surplus. These sales were made through the Reconstruction Finance Corp.

Vought Corsair Praised by Marines in Central Pacific

The Vought F4U-1D Corsair made the longest "bomb weight per mile" strike of any single-engine airplane, it was disclosed in a field report received by Chance Vought Aircraft Division, United Aircraft Corp., Stratford, Conn., on operations of a Marine fighter-bomber squadron in the Central Pacific.

The report stated: "In order to make use of Corsair's capabilities, the squadron carried bombs instead of gas, and made many long flights of low fuel consumption carrying heavy bomb loads. On one such flight the squadron set what remains to this writing as the longest bomb weight per mile strike of any single-engine aircraft."



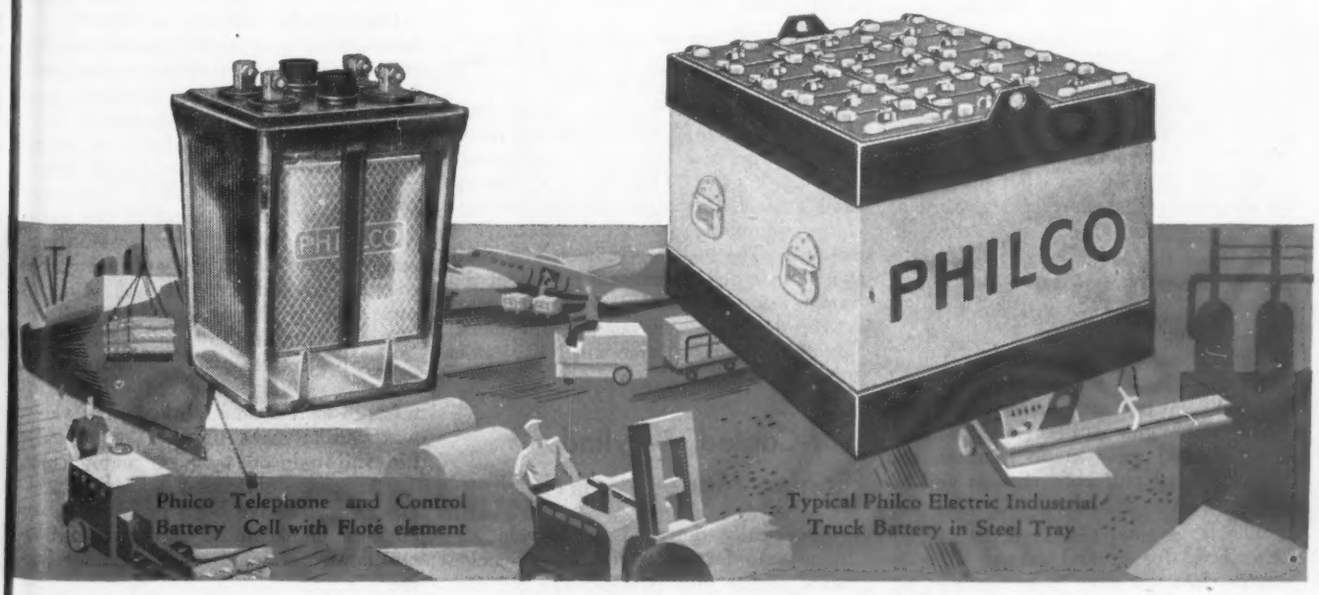
POSTWAR AIRLINER: Sleek and streamlined, this transport, designed for Consolidated Vultee Aircraft Corp., will carry 204 passengers and 15,300 pounds of baggage. Pan American Airways has ordered 15 of these planes to be used on long-distance routes. An interior view showing one of the lounges is shown at left. NEA photos

The new Philco "Thirty", with 30% longer life, is identified by its distinctive red top.

Consistently through the years, users of PHILCO Storage Batteries—both motive power and stationary types—have been *first* to get the major developments contributing to high capacity, greater efficiency, longer life, lower cost. Newest Philco *first* in industrial storage battery engineering is the new Philco "Thirty" with *30% longer life*—now available in certain types and limited quantities for electric industrial trucks. Catalogs of this and other modern Philco Batteries for your special needs will gladly be sent on request.

Philco Corporation, *Storage Battery Division,* Trenton 7, New Jersey

For 50 years a leader in Industrial Storage Battery Development



Philco Telephone and Control Battery Cell with Floté element

Typical Philco Electric Industrial Truck Battery in Steel Tray

SERVICING JET ENGINE: Army Air Forces mechanics require less time for maintenance of jet engines than of the conventional reciprocating motors, according to reports from the Air Technical Service Command at Wright Field, O. Only 11 bolts hold this simple but powerful GE jet engine on a Bell P-59A training plane

Maintenance Problems Reduced by Simple Design of New Jet Propulsion Engines

SIMPLICITY in design and operation of the turbo-jet engine developed and produced by General Electric Co. for fighter planes of the Army Air Forces has eliminated many maintenance problems and sharply reduced others.

Staff Sergeant Earl Kohler, a jet crew chief at Wright Field, Air Technical Service Command headquarters in Ohio, says that maintenance of one of the engines now being used in the propellerless Bell P-59A planes requires "less than a fifth" of the time and labor that would be necessary on a conventional airplane motor.

The fact the engine has only approximately one-tenth as many moving parts as does the ordinary reciprocating motor explains much of the savings in maintenance. There are only eleven bolts holding the engine in place. In the engine there are but two main bearings and one shaft. An engine can be pulled with an inexperienced crew in 35 minutes, and four men can pull both engines and install new ones in a day.

The jet engines also save time in another way for ground crews. The jet engine does not have to be warmed up. A minute after the starter button has been pressed, the pilot can take off. The ground crew men also report that once a flight is over the engine is cool enough to be taken out by the time they get the cowling off.

Air, sometimes as cold as 75 degrees below zero, is whipped into the engine and compressed by the impeller. It flows to the combustion chamber where fuel, such as kerosene, is ignited; this increases the pressure and raises the temperature to blazing heat. The stream of hot air and gases then passes through the turbine, spinning it thousands of times a minute. The turbine, connected by shaft with the impeller, furnishes power for the compression process. The air and gases sweep in a stream on out the jet exhaust, giving the reactive force which drives the plane forward.

Air-Cooled, 7-Cylinder Engine Made by Wright

Specifically designed to provide airframe manufacturers with an air-cooled radial engine in a power range not covered by designers during the past eight years, a new 7-cylinder Wright Cyclone aircraft engine using inexpensive low-octane fuel and developing 700 horsepower, has been announced by G. W. Vaughan, president, Wright Aeronautical Corp. and Curtiss-Wright Corp.

Prototype models of the engine, test flown in standard aircraft, have already demonstrated satisfactory power output, fuel economy, and smooth operation.

Built by the same engineers who designed the giant 18-cylinder engine powering the B-29 Superfortress, the Lockheed Constellation, and the Martin Mars, the Cyclone 7 will give airframe manufacturers an opportunity to design military short haul-type cargo planes and advanced trainers around the 700 horsepower installation.

Wright officials indicated the Cyclone 7 follows the conventional "time tested" design of air-cooled radial engines generally. Basically, the new engine is the latest model of one which powers more than 80 per cent of the nation's airlines—but with seven cylinders instead of nine, and combustion chamber design appropriate for gasoline of an octane rating considerably lower than that of American warplanes and transports.

Many Parts Are Interchangeable

Close resemblance to the Cyclone 9, it was claimed, makes possible interchangeability of many parts of the nine-cylinder and seven-cylinder types, simplifies maintenance problems and makes possible more economical manufacture.

The low-octane fuel factor, it is claimed, will enable operators to save expenses on gasoline; for the transport job to be done by planes in the 700-horsepower range, the high-octane fuel is not necessary. That the fuel savings can become appreciable was indicated by reference to the fact that fuel costs account for 12 per cent of air transport operating expenses.

The Cyclone 7 makes use of the forged cylinder heads developed by Wright Aeronautical to provide greater strength and ruggedness. Providing an unprecedentedly efficient cooling factor, the new cylinder assemblies embody longer valve guides, greater cooling fin area in the vicinity of exhaust valve guide bosses and a self-aligning exhaust valve seat to insure proper alignment of the valve. Barrels of cylinders incorporate aluminum fins for improved cylinder barrel cooling; this, in turn, it was said, assures longer piston ring life and improved piston lubrication.

A valve gear lubrication system which makes use of a series of external oil tubes to increase the lubrication of valves was said to make possible longer valve life and reduced cylinder maintenance. To improve lubrication within the engine, oil jets have been provided in the engine's crankcase to direct a continuous flow of oil into each cylinder barrel.

ADD YEARS OF SERVICE TO WORKING PARTS

USE STAINLESS — SURFACE HARDENED

"YOU SOLVED OUR PROBLEM!"

says the chief engineer of a prominent manufacturer of pressure reducing valves

"Surface hardened stainless steel proved to be the answer for prolonging the life of the working parts of our pressure reducing valves —even though the following hazards always are present:

"Dry, sliding friction under high temperatures rasps away at the surface of cylinder lining and piston wall . . . high pressure steam at 600 psi. develops pressure-cutting velocities to ruin valve seats . . . heat—750° of it—places heavy strain on valve stems and close fitting surfaces.

"The glass-hard surface provided by the Stainless Surface Hardening Process plus the inherent corrosion resisting qualities of Stainless Steel licked our problem, I'm glad to say."

Combining the corrosion resistance of Stainless with the abrasion resistance of a nitrided surface, the Stainless Surface Hardening Process minimizes operating hazards likely to endanger vital working parts of your product.

This efficient new process provides stainless steel with a "glass-hard" (91 to 97 Rockwell 15-N) surface. Dimensional characteristics are not appreciably affected . . . for parts machined to almost exact dimensions need only a light grinding or lapping after processing.

Both austenitic and martensitic grades of stainless steel now can be surface hardened with this process. Highly stressed parts in which heat treatment has developed high tensile strength, ductility and impact resistance, can be surface hardened by this process to insure great abrasion resistance, without altering core properties.

Surface hardening will extend the service life of your stainless steel valves, pumps or instrument parts . . . write or call today for detailed information.

EVERYTHING IN STAINLESS STEELS!

Whatever your Stainless requirements—sheets, bars, tubing, wire, valves, fittings, even bolts and nuts—the inventory of Industrial Steels, Inc. is complete and comprehensive . . . and you'll receive same-day attention to your order. One way to save valuable time and needless bother . . . one way to speed all your Stainless requirements to your plant . . . is to place your entire order with Industrial—where the largest and most diversified warehouse stock of stainless steels in America is maintained. Expert metallurgists at Industrial gladly will assist you with any Stainless specification or fabrication problem. For complete catalog, write Industrial Steels, Inc., Cambridge 41, Mass.

S S CO H

STAINLESS SURFACE HARDENING CO.

255 BENT STREET, CAMBRIDGE 41, MASS.

SUBSIDIARY OF INDUSTRIAL STEELS, INC.

M. A. Hanna Co. Buys Interest in Evergreen Mines

Cleveland firm will manage Evergreen iron ore properties. Evergreen president to be Hanna ore sales manager

SUBSTANTIAL stock interest in the Evergreen Mines Co., Crosby, Minn., large independent producer of iron and manganiferous ores, has been acquired by the M. A. Hanna Co., Cleveland, which will manage operations of the Evergreen iron ore properties.

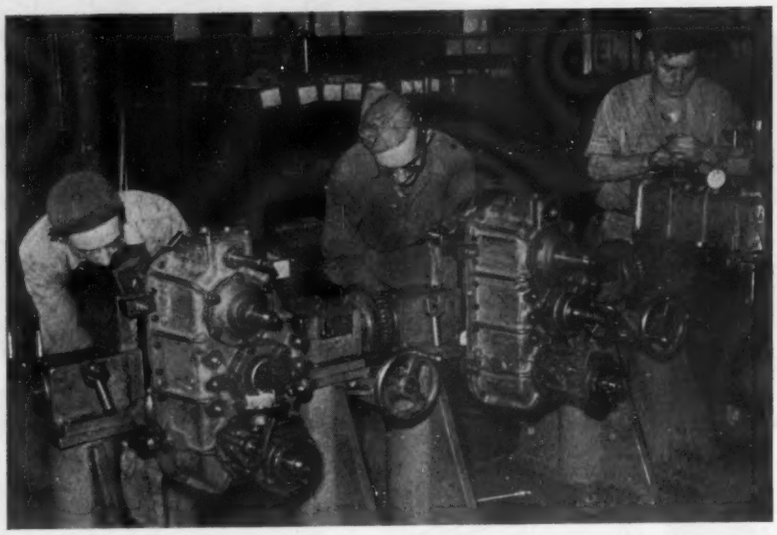
The interest acquired by the Hanna company was purchased from the estate of Donald R. McLennan, Chicago, which will retain the balance of the stock.

Perry G. Harrison, who has been with Evergreen since 1927, will continue as president of Evergreen. Under his management the company has been built up from a one-mine Cuyuna range producer of less than 50,000 tons of ore per year prior to 1928 to the distributor of approximately three million tons of ore annually during the last several years produced from a number of mines.

With addition of the Evergreen properties, the Hanna company will have under its operating management 25 iron ore mines in Minnesota, Michigan, New York, and Missouri.

In addition to being president, Mr. Harrison will become ore sales manager of the Hanna company and will be located in Cleveland, but will retain his home and office space with the Evergreen Mines Co. at Crosby.

Since 1940, the M. A. Hanna Co. has equipped and placed in operation the Clifton mine in New York state, the Wauseca mine near Iron River, Mich., and recently the Iron Mountain mine in Missouri was put into operation.



RETURNED VETERANS: Important war jobs are being performed by these returned veterans of World War II, shown above assembling transfer cases manufactured by Lodge & Shipley Machine Tool Co., Cincinnati. Left to right, they are: George Snyder, Ralph A. Dixon and Maynard Phillips

Basic Refractories Field Sales Changes Announced

Reorganization of its refractory field sales organization was announced last week by Basic Refractories Inc., Cleveland.

T. W. Shook was named manager of refractory sales, succeeding the late Huntington Downer. Mr. Shook joined the company in 1940 and has served as manager of product development as well as in other sales, production and research capacities. He will be located at the company's Cleveland headquarters in the Hanna Building, working directly with Samuel Eells, vice president and director of sales.

New sales offices are being opened in Philadelphia and Gary. Thomas P. Stanton will serve the Philadelphia territory, under direction of the Pittsburgh office, of which H. D. Largey, eastern regional manager, is head. Also operating from Pittsburgh is D. B. Baxter, district manager for the Pittsburgh and Wheeling districts.

In charge of the Gary office is J. D. Hysong, who becomes Chicago district manager, C. R. Heilig is named district manager for the central districts including most of Ohio, and the southeastern states, with headquarters in Cleveland.

In the Mississippi Valley and Southwest, the company will continue to be represented by Eston Randolph, St. Louis, and on the Pacific Coast by H. J. Kumer, Los Angeles, both reporting directly to Cleveland headquarters.

Also located at the Cleveland offices is J. D. Platt, manager of retail refractory sales, a department established to introduce new refractories for forge and billet-heating furnaces and other types of furnaces, both ferrous and nonferrous, as well as for general industrial furnace applications. Distribution is being effected through sales agents in principal market centers.

BRIEFS . . . .

Paragraph mentions of developments of interest and significance within the metalworking industry

Aerojet Engineering Corp., Pasadena, Calif., has been given a Defense Plant Corp. contract to provide additional equipment at a plant in Azusa, Calif.

—o—

Specialty Device Co., Cincinnati, has moved to 1940 River road.

—o—

R. K. LeBlond Machine Tool Co., Cincinnati, has appointed the Ford Machinery Co., Toledo, as its agent in the Toledo territory.

—o—

Pangborn Corp., Hagerstown, Md., has put into effect employes' profit-sharing plan paid for entirely by the corporation.

—o—

G. A. Gray Co., Cincinnati, has named Joseph Monahan, Grand Rapids, Mich., its exclusive sales representative in western Michigan.

—o—

Birmingham District Industrial Development Corp., Birmingham, Ala., has started a program to attract diversified, noncompetitive industries to that area.

—o—

Manhattan Rubber Mfg. Division, Raybestos-Manhattan Inc., has announced from its Passaic, N. J., office that for meritorious industrial achievement the Army Air Forces Air Technical Service Command has awarded it the approved quality control rating.

—o—

B. F. Goodrich Co., Akron, O., has

announced that a new all-time high in total and per-person awards for war-production suggestions was set in 1944.

—o—

American Welding Co., wholly-owned subsidiary, American Car & Foundry Co., has announced the closing, effective April 30, of its Carbondale, Pa., plant, disposal of all equipment, and offering of the plant for sale because it is no longer needed.

—o—

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has changed the names of two of its divisions. The former Radio Division becomes the Industrial Electronics Division, and the former Radio Receiver Division becomes the Home Radio Division.

—o—

Battelle Institute, Columbus, O., has instituted under sponsorship of the Non-ferrous Ingot Metal Institute a study of gases and other factors affecting the soundness of castings made from copper-base alloys.

—o—

Whitehead Metal Products Co., New York, has been appointed eastern distributor for welding electrodes manufactured by the A. O. Smith Corp., Milwaukee.

—o—

General Electric Co., Schenectady, N. Y., has paid out during the past 25 years $24,282,095 in death and disability payments through group insurance.

—o—

International Detrola Corp., Detroit, shipped in November, December, and January $9,100,000 worth of war equipment.

—o—

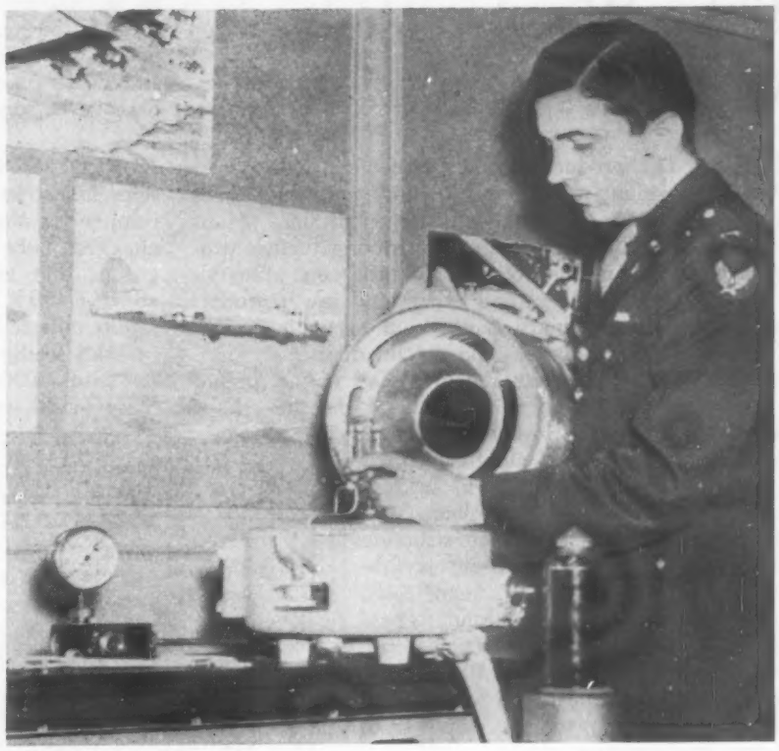
Homestead Valve Mfg. Co. Inc., Coraopolis, Pa., has started production at its new cleaning-compound plant at Edgeworth, Pa.

—o—

ACF-Brill Motors Co., Philadelphia, has arranged for the Canadian Car & Foundry Co. Ltd., Montreal, Quebec, to manufacture in Canada the ACF-Brill design motor buses and trolley coaches and sell them under the name of Canadian Car-Brill.

Farrel-Birmingham Co. Buys Atwood Machine Co.

Farrel-Birmingham Co. Inc., Ansonia, Conn., heavy foundry operator and machine builder, with plants also at Derby, Conn., and Buffalo, has acquired through purchase Atwood Machine Co., textile mill equipment builder, Stonington, Conn. Franklin R. Hoadley, president, Atwood company, has been named president, Farrel-Birmingham Co. Inc., and W. M. Fraser, Atwood vice president, becomes general manager at Stonington. Franklin Farrel Jr., is chairman of the board, Farrel-Birmingham. Mr. Hoadley succeeds John W. Haddock, Bridgeport, Conn., who recently resigned.



LONG LIFE BEACON: Air Technical Service Command officer examines a new air beacon lamp, which will burn for a year without attention. Developed by the ASTC for use on isolated mountain peaks and other inaccessible places, the lamp is lighted and turned off by the sun's rays on the photoelectric cell in the foreground. AAF photo from NEA

AWARDS . . . .

Additional war plants honored with Army-Navy-Maritime emblems for outstanding achievement in the production of war materials

Additional firms which have been awarded the Army-Navy "E" for excellence in the manufacture of war materials are:

Artcrest Mfg. Co., Chicago.
Chandler-Evans Corp., Dayton plant, Dayton, O.
Diecasters Inc., Ridgefield, N. J.
Manufacturing Industries Inc., Chicago.
A. J. Miller Auto Cruiser Trailer Co. Inc., Bradenton, Fla.
The Monarch Marking System Co., Dayton plant, Dayton, O.
Nuodex Products Co. Inc., Elizabeth plant, Elizabeth, N. J.
The Trumbull Mfg. Co., Warren, O.
Zenite Metal Corp., main plant, Indianapolis.
The J. A. Zurn Mfg. Co., Sixteenth street division, Erie, Pa.
American Machine & Foundry Co., Brooklyn plant, Brooklyn, N. Y.
Andrea Radio Corp., Long Island City, N. Y.
Automatic Electric Mfg. Co., Mankato, Minn.
Dwyer Products Corp., Michigan City, Ind.
Fassler Iron Works Inc., New York.
Brad Foote Gear Works Inc., Chicago.
Freed Radio Corp., New York.
Karp Metal Products Co. Inc., Brooklyn, N. Y.
Lyon & Healy Inc., Lake street plant, Chicago.
The Muter Co., Chicago.
Westinghouse Electric & Mfg. Co., U. S. Naval ordnance plant, Canton, O.
The Refinite Corp., Omaha, Nebr.
Samson United Corp., Rochester plant, Rochester, N. Y.
Sperry Gyroscope Co. Inc., Marine Division, Brooklyn, N. Y.
Triumph Explosives Inc., Elkton, Md.
United States Instrument Corp., East Orange, N. J.
Cochrane Corp., Philadelphia.
Federal Screw Works, Detroit.
Treadwell Engineering Co., Easton, Pa.
U. S. Machine Corp., Lebanon, Ind.
National Powder Co., Eldred, Pa.
Surface Combustion Co., Toledo, O.
John C. Turner Corp., Wapakoneta, O.
Bendix Aviation Corp., Pacific Division, North Hollywood, Calif.
Dewey-Shepard Boiler Co. Inc., Peru, Ind.
Gar Wood Industries Inc., Boat Division, Marysville, Mich.
Hi-Voltage Equipment Co., Cleveland.
Johnston Tin Foil & Metal Co., South Affton plant, South Affton, Mo., and St. Louis plant.
Leland Electric Co., North Main street plant and Webster street plant, Dayton, O.
Master Tire & Rubber Corp., Findlay, O.
Henry Owens & Co., Providence, R. I.
Pacific Car & Foundry Co., Billings plant, Billings, Mont.

THE BUSINESS TREND

Milder Weather Aids War Production

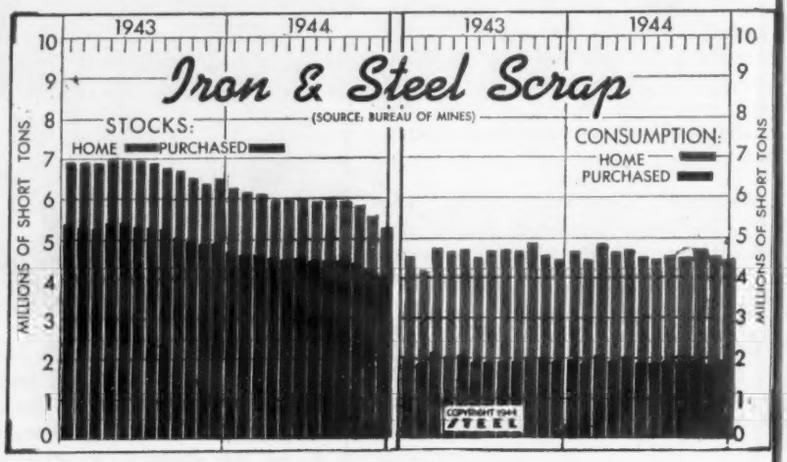
INDUSTRIAL production is at a somewhat higher level than that prevailing throughout January and early February, due to more favorable weather conditions. Manpower shortage is the chief factor restricting further production gains in a number of key war programs, although loss in production of steel and other vital raw materials experienced during January is expected to set back output of war items throughout the second quarter.

Steel ingot production has regained most of the ground lost earlier this year and is currently at the same level registered during the closing months of 1944. Compared with a month ago, encouraging gains have developed in revenue freight carloadings, petroleum production, and engineering construction awards. Bituminous coal output is substantially unchanged from a month ago despite an all-out effort to stimulate production of much needed coal. Electric power consumption is substantially lower than a month ago, due to seasonal factors and forced curtailment in use of power to conserve coal supplies.

SCRAP—Stocks of iron and steel scrap at consumers', suppliers' and producers' plants on Dec. 31 last approximated 5,335,000 gross tons, or the lowest level recorded since Aug. 31, 1942. Throughout 1944 scrap stocks were reduced 1,125,000 tons. Consumers' inventories at the year end were 3,951,000 tons, or 1,343,000 below that registered on the same date in 1943. Scrap stocks of suppliers and producers were up 120,000 tons during 1944, to reach a total of 1,384,000 tons at the close of last year.

Although scrap consumers re-entered the market in the closing months of last year, supplies of scrap were not sufficient to enable dealers to increase their shipments. The severe winter weather, which started in December, was instrumental in reducing scrap inventories still further during January, for the movement of production scrap to consuming points was practically at a standstill during that period and dealers were able to process only a relatively small tonnage of scrap through their yards.

EMPLOYMENT—Wage-earner employment in the munitions industries, which increased from November to December for the first time in a year, was essentially unchanged between December and January. The only groups that increased significantly were iron and steel and chemicals. An increase of 4000 in the iron and steel group reflected the stepping up of production programs in shell loading, heavy ammunition and guns. The increase of 8000 in chemicals was concentrated almost entirely in the small arms ammunition industry.



Iron and Steel Scrap
Bureau of Mines
(Gross Tons)

	Consumers, Stocks		Total Consumption	
	1944	1943	1944	1943
January	6,214,000	6,877,000	4,616,000	4,492,000
February	6,134,000	6,871,000	4,414,000	4,178,000
March	6,027,000	6,850,000	4,827,000	4,787,000
April	5,932,000	6,918,000	4,629,000	4,642,000
May	5,966,000	6,905,000	4,683,000	4,723,000
June	5,991,000	6,916,000	4,460,000	4,493,000
July	5,909,000	6,860,000	4,423,000	4,670,000
August	5,975,000	6,778,000	4,533,000	4,686,000
September	5,953,000	6,613,000	4,471,000	4,657,000
October	5,832,000	6,456,000	4,684,000	4,830,000
November	5,624,000	6,391,000	4,527,000	4,581,000
December	5,335,000	6,448,000	4,487,000	4,449,000
Monthly Average	5,908,000	6,740,000	4,563,000	4,599,000

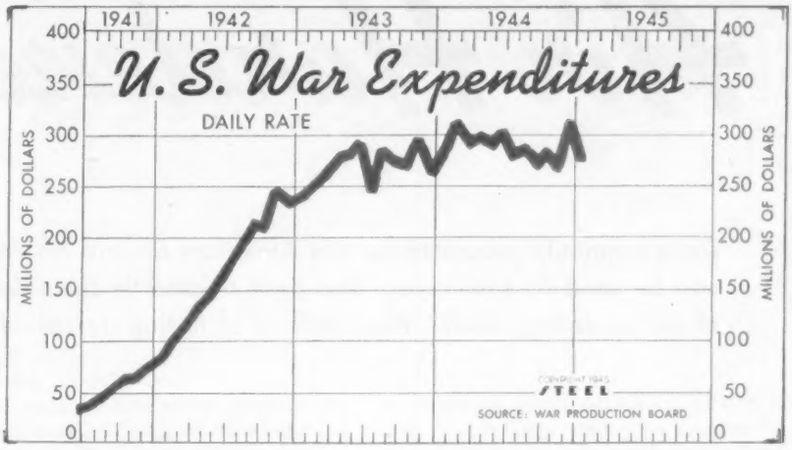
FIGURES THIS WEEK

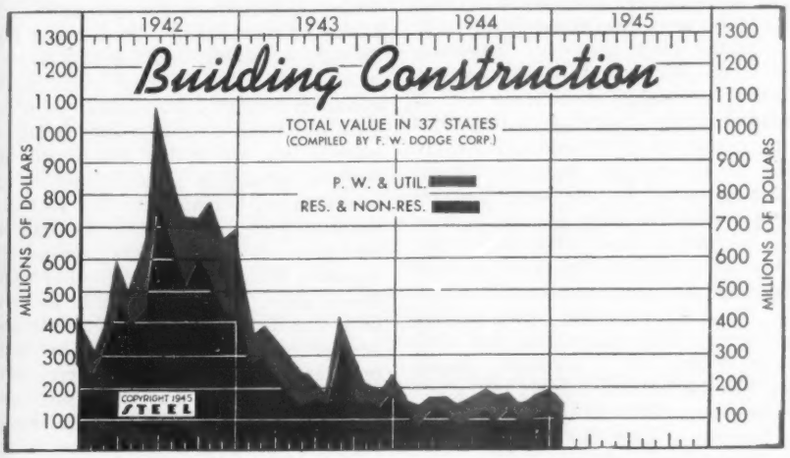
INDUSTRY	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	96	93	93.5	97.5
Electric Power Distributed (million kilowatt hours)	4,474	4,472	4,577	4,445
Bituminous Coal Production (daily av.—1000 tons)	1,908	2,031	1,993	2,065
Petroleum Production (daily av.—1000 bbls.)	4,778	4,781	4,727	4,423
Construction Volume (ENR—unit $1,000,000)	$16.3	$43.9	$8.8	$22.2
Automobile and Truck Output (Ward's—number units)	21,015	21,010	20,765	19,305
TRADE				
Freight Carloadings (unit—1000 cars)	780†	784	759	782
Business Failures (Dun & Bradstreet, number)	14	23	16	36
Money in Circulation (in millions of dollars)	$25,652	$25,533	$25,775	$20,696
Department Store Sales (change from like week a year ago)‡	+22%	+11%	+14%	−21%

*Dates on request.
†Preliminary. ‡Federal Reserve Board.

War Expenditures
(millions)

	1945 Monthly Expenditures	1945 Daily Rate	1944 Monthly Expenditures	1944 Daily Rate
Jan.	$7,520	$278.5	$7,416	$285.2
Feb.	....	....	7,808	312.3
Mar.	....	....	7,948	294.4
Apr.	....	....	7.493	299.7
May	....	....	7,918	293.3
June	....	....	7,957	306.0
July	....	....	7,355	282.9
Aug.	....	....	7,798	288.8
Sept.	....	....	7,104	273.2
Oct.	....	....	7,447	286.4
Nov.	....	....	7,095	272.9
Dec.	....	....	7,835	313.4
Total	....	....	91,174	Ave. 292.2





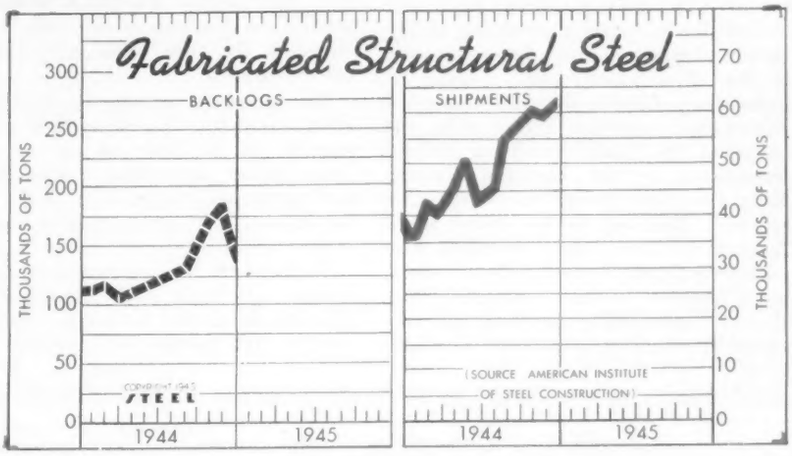
Construction Valuation
In 37 States
(Unit—$1,000,000)

	Total	Public Works-Utilities 1945	Public Works-Utilities 1944	Residential-Non-Res. 1945	Residential-Non-Res. 1944
Jan.	140.9	39.8	50.3	101.2	108.9
Feb.	....	...	55.1	....	82.1
Mar.	....	...	61.3	....	115.1
April	....	...	72.0	....	107.3
May	....	...	55.8	....	88.4
June	....	...	70.7	....	93.1
July	....	...	80.5	....	110.0
Aug.	....	...	69.4	....	99.9
Sept.	....	...	64.1	....	111.6
Oct.	....	...	52.2	....	92.6
Nov.	....	...	48.0	....	116.9
Dec.	....	...	66.6	....	121.8
Total	....	...	746.0	....	1,247.2

Fabricated Structural Steel
(1000 tons)

	Shipments 1944	Shipments 1943	Shipments 1942	Backlogs 1944	Backlogs 1943	Backlogs 1942
Jan.	35.2	91.9	167.8	113.1	339.1	704.4
Feb.	42.9	90.8	164.6	117.6	321.0	706.7
Mar.	41.4	94.0	191.3	106.3	299.8	777.7
Apr.	44.5	86.6	187.2	111.2	272.5	772.4
May	50.7	78.9	184.2	116.3	220.6	843.3
June	43.0	68.4	182.7	122.7	207.1	869.3
July	45.3	56.8	189.9	125.4	201.8	808.6
Aug.	55.2	50.2	173.9	130.4	195.6	783.5
Sept.	57.5	51.8	169.8	151.1	208.1	716.0
Oct.	61.6	80.1	152.9	174.4	274.0	617.7
Nov.	59.4	42.7	130.4	184.2	134.6	566.6
Dec.	61.3	39.6	145.3	142.5	113.0	523.5

Source: American Institute of Steel Construction. Figures for 1943 to date cover members' reports only; for other years they are estimates for the entire industry.



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	$11,756	$9,450	$11,119	$8,449
Federal Gross Debt (billions)	$234.4	$234.2	$233.3	$189.6
Bond Volume, NYSE (millions)	$48.0	$46.6	$58.4	$56.2
Stocks Sales, NYSE (thousands)	7,311	8,320	6,818	3,973
Loans and Investments (millions)†	$58,923	$59,007	$59,635	$53,854
United States Gov't. Obligations Held (millions)†	$44,061	$44,219	$44,393	$39,139

†Member banks, Federal Reserve System.

PRICES

STEEL's composite finished steel price average	$57.55	$57.55	$57.55	$56.73
All commodities†	105.0	104.9	104.8	103.3
Industrial Raw Materials†	116.2	116.0	115.8	113.0
Manufactured Products†	101.6	101.6	101.6	100.6

†Bureau of Labor's Index, 1926 = 100.

Air Hardenability of

Data originally prepared for the American Society for Metals can be used by toolmakers and heat treaters in the selection of air hardening steels. New method of testing described

AIR HARDENING steels have definite advantages in certain types of tool steel applications due to the ease of heat treatment, relatively small distortion after hardening, and probably most important, the absence of appreciable thermal gradients during quenching, resulting in practically complete freedom of quench-cracks in intricate sections. In contrast to the abundance of hardenability data relating to water and oil hardening types of steel, practically no quantitative data on the hardenability of air hardening types of steel are available.

This article describes an air hardenability test and a method of stating air hardenability in such a manner that these data can be used by toolmakers and heat treaters to aid in the selection of air hardening steels. The test developed consists of air cooling a 1-inch round bar in such a manner that one end is allowed to cool freely, while the cooling of the other end is retarded to a rate equivalent to that of a 6-inch round cylinder 6-inches long. Cooling velocities through a temperature range are known along the length of the 1-inch round bar. A determination of the hardness gradient along the 1-inch round bar enables the rockwell hardness to be stated as a function of these cooling velocities. The parameter found to give the closest agreement between hardness predicted from the air hardenability test and that obtained by actual heat treatment of various size sections is the cooling rate (degrees Fahr. per minute) past 1000 degrees Fahr.

The most obvious application of such a test is the prediction of the hardness to be expected of a given air hardening steel when air treated in various size pieces. The application of these data is simplified by the fact that cooling rates in the vicinity of 1000 degrees Fahr. are equal throughout the mass during air hardening, except for extremely irregular shapes having fins, pins, etc., protruding from the larger mass. This means that air hardening leads to the same hardness throughout the mass from center to surface. Thus, knowing the center cooling rate (degrees Fahr. per minute past 1000 degrees Fahr.) of a regularly shaped mass, and the air hardenability of a given air hardening steel (rockwell C hardness as a function of degrees Fahr. per minute past 1000 degrees Fahr.), it is easy to predict the hardness which will be obtained in the mass when using this air hardening steel.

The simplicity of this application of air hardenability data depends to a large measure on the effect of (a) shape of piece (round, rectangular, long or short), and (b) treating temperature on the cooling rate of a regularly shaped mass of steel.

Experiments have shown that the air cooling rate (past 1000 degrees Fahr.) of regularly shaped masses is a function only of the surface/volume ratio, and further, this cooling rate (past 1000 degrees Fahr.) for a given surface/volume ratio appears to be independent of treating temperature.

Development of an Air Hardenability Test: The test developed for this purpose consists of taking a 6-inch round by 6-inch long slug of 32 per cent nickel-iron alloy, drilling a 0.858-inch diameter hole through its center, and tapping about 1 inch at each end. The hardenability specimen itself is 7 inches long, of which 4 inches of this length (1-inch diameter) extends from the end of the 6-inch slug and the remaining 3 inches (0.856-inch in diameter) reaches into the center of the slug. Two specimens are inserted, one into each end of the 6-inch round, the assembly is then heated to the hardening temperature, soaked at heat, removed from the furnace, placed on an elevated wire screen, and air cooled. The specimens are then unscrewed, flats ground on two opposite sides, and hardnesses taken at locations corresponding to definite cooling rates past 1000 degrees Fahr.

Tests were run to determine the cooling rate of the hardenability specimen at distances of ⅛, ⅝, 1¼, 2, 2¾ and 3⅛ inches from the face of the 6-inch slug; at 1 inch below the face; and at the center of the 6-inch slug with the specimen in place. For these measurements ⅛-inch diameter holes were drilled to the center of the 1-inch round specimen, and a 22-gage iron constantan couple with an 0.120-inch diameter two-hole insulator was then wedged into the hole. The assembly was heated to temperature, removed from the furnace, and air cooled by placing on a screen. Data for time

TABLE I
A COMPARISON OF HARDNESS ON HARDENABILITY SPECIMEN AND ACTUAL SIZE ROUNDS, BASED UPON EQUAL COOLING RATES PAST 600, 1000, AND 1300 DEGREES FAHR.

Steel	Treating Temps. Deg. F.	Rc in 4" Rd — 20 Min. Soak	Rc in 4" Rd — 2 Hr. Soak	Rockwell C at 0.12" (Degrees Fahr. 1300)	Rockwell C at 0.60" (Degrees Fahr. 1000)	Rockwell C at 2.00" (Degrees Fahr. 600)	Difference in Rc at 0.12" (Degrees Fahr. 1300)	Difference in Rc at 0.60" (Degrees Fahr. 1000)	Difference in Rc at 2.0" (Degrees Fahr. 600)
L	1550	60	60	56.5	60	62.5	—3.5	0	+2.5
M	1550	62	63	61	62	64	—1.0	0	+1.0
N	1550	61	59	57	59.5	62	—2.0	0	+1.0
O	1550	63	62	61	62.5	63	—1.0	0	0
P	1550	64	63	63.5	62.5	62.5	0	—0.5	—0.5
Q	1550	57	58	53	56	60.5	—4.0	—1.0	+2.5
R	1550	63	62	62	61	61.5	0	—1.0	—0.5
S	1550	62	63	59.5	61	63.5	—2.5	—1.0	+0.5
		2.10 Per Cent C,		12.5 Per Cent Cr.			1.0 Per Cent Mo Steel		
				0.12"	0.65"	2.00"	0.12"	0.65"	2.00"
				Degrees Fahr.					
		45 Min Soak		1300	1000	600	1300	1000	600
C	1750	44/45		45.5	46	61.5	+0.5	+1.0	+16.5
				0.40"	0.80"	2.00"	0.40"	0.80"	2.00"
				Degrees Fahr.					
		45 Min Soak		1300	1000	600	1300	1000	600
C	1800	50		49	51	62	—1.0	+1.0	+14

# of Steel

By C. B. POST
M. C. FETZER
And
W. H. FENSTERMACHER
Metallurgical Department
The Carpenter Steel Co.
Reading, Pa.

temperature curves were obtained with a potentiometer.

Fig. 1 shows the rates past 1000 and 1300 degrees Fahr. (1075/925 and 1375/1225 degrees Fahr.) Three curves are shown on each set, one representing rates for an initial temperature of 1600 degrees Fahr., one for 1750 degrees Fahr. and one for 1900 degrees Fahr. Unlike the simple shapes, the cooling rate of the hardenability specimen is influenced by the initial temperature due to the feeding action of the 6-inch round slug. The higher the initial temperature, the greater this feeding action.

With this test a range of area to volume (A/V) from 1.0 to 4.25 is covered in one cooling cycle, i.e., 21 to 105 degrees Fahr. per minute past 1000 degrees Fahr. A cooling rate of 124 degrees Fahr. per minute may be obtained by air treating a 1-inch round by 2-inch long (area-to-volume ratio of 5) specimen. After heat treatment, the hardenability test specimen can be nicked and broken for fracture grain size.

It was found that the cooling curve at any given location on the hardenability specimen did not follow that of simple shapes, but instead, the cooling rate became less, relative to the simple shape, as the temperature dropped. For example, at a distance of 2 inches from the face of the 6-inch slug the hardenability specimen cools

—like a 1.62-inch diameter by 1.62-inch long piece past 1300 degrees Fahr.
—like a 2.14-inch diameter by 2.14-inch long piece past 1000 degrees Fahr.
—like a 3.00-inch diameter by 3.00-inch long piece past 600 degrees Fahr.

(*Please turn to Page* 132)

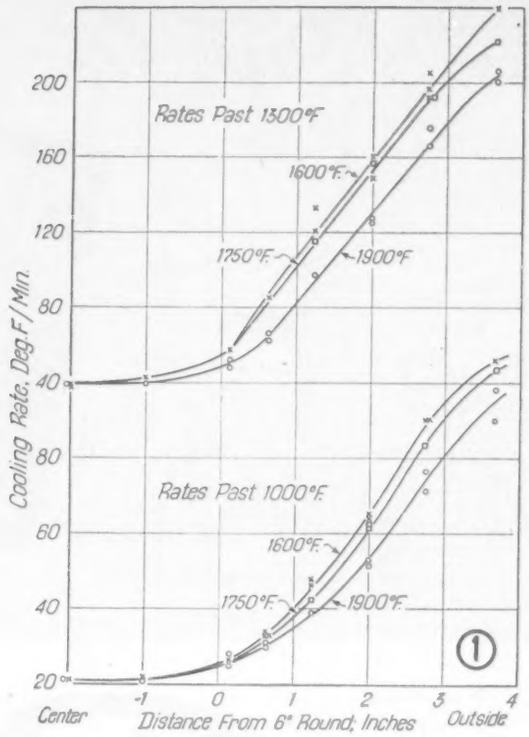


Fig. 1—Cooling rates along the hardenability specimen for treating temperatures of 1600, 1750 and 1900 degrees Fahr.

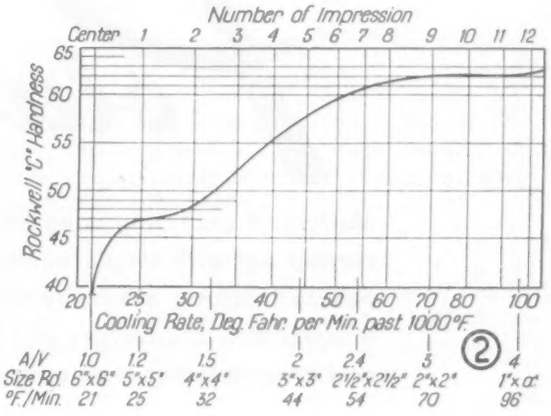

Number of Impression
Center 1 2 3 4 5 6 7 8 9 10 11 12
Rockwell "C" Hardness
Cooling Rate, Deg. Fahr. per Min. past 1000°F.
②
A/V 1.0 1.2 1.5 2 2.4 3 4
Size Rd. 6"x6" 5"x5" 4"x4" 3"x3" 2½"x2½" 2"x2" 1"x1"
°F/Min. 21 25 32 44 54 70 96

Fig. 2—Air hardenability chart, hardness plotted against cooling rate

Fig. 3—Effect of treating temperature on air hardenability of steels, A, B, and C. Treating temperature and fracture grain size are shown on each of the curves

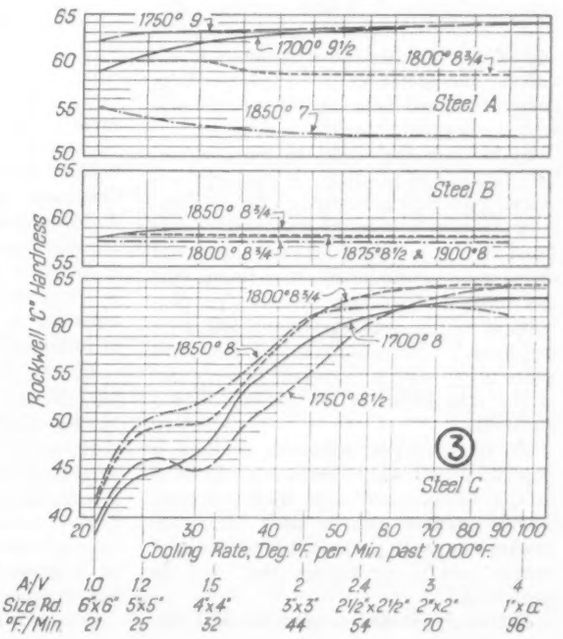
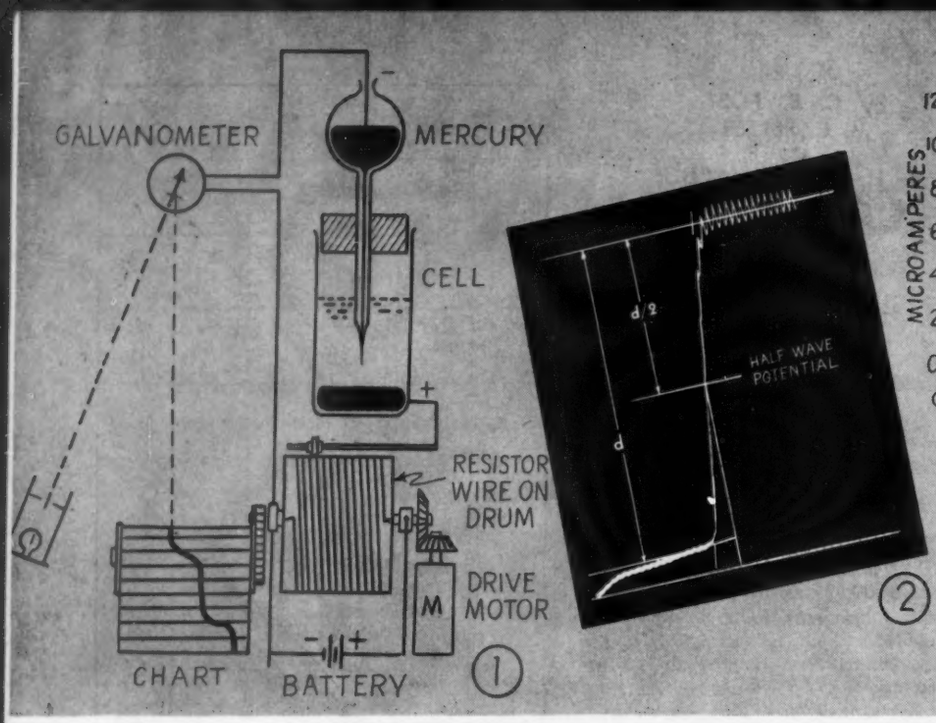
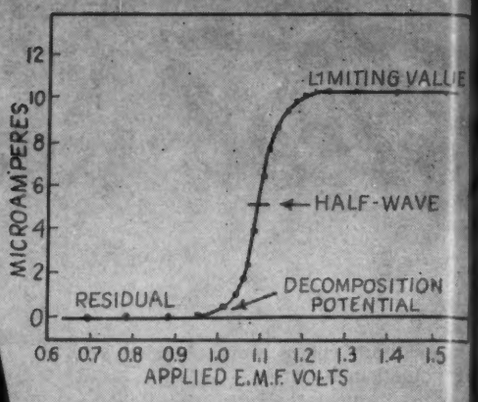


TABLE II
LOCATIONS FOR MEASURING HARDNESS ON HARDENABILITY SPECIMEN DEPENDING ON INITIAL HEATING TEMPERATURE

Number of Impression	Cooling Rate °F./Min. Past 1000° F.	Location in Inches on Hardenability Specimen Where This Cooling Rate Occurs Using Initial Temperatures of 1600° F.	1750° F.	1900° F.
Center	21	Center	Center	Center
1	25	0	0	0
2	30	0.45	0.50	0.62
3	35	0.75	0.85	1.00
4	40	1.00	1.13	1.35
5	45	1.22	1.38	1.64
6	50	1.44	1.60	1.87
7	55	1.65	1.78	2.07
8	60	1.82	1.98	2.27
9	70	2.16	2.31	2.61
10	80	2.47	2.62	3.00
11	90	2.78	3.00	3.40
12	100	3.25	3.48	....
13	105	3.60	3.85	....





Polarography

Method of analyzing complex metal alloys is extremely fast, sensitive and carried out with simple equipment by easily learned and calibrated procedure. Extreme sensitivity detects as little as 1/10,000 per cent of an element with an accuracy of 1 per cent of amount present. Tin plate industry and electroplating seen as most important immediate fields of application

By G. W. BIRDSALL
Associate Editor, STEEL

COMPARATIVELY new, yet proving extremely useful, is a little known method for chemically analyzing many metals and alloys. Called polarography, it involves interpretation of current-voltage curves obtained from an electrolytic cell with a dropping mercury electrode.

By putting the metal to be analyzed in solution and applying a gradually increasing voltage between a pool of mercury in the bottom of the cell and a small capillary tube from which mercury drops issue continuously, it is found that the current does not increase in proportion to the applied voltage but rises in "steps." Each step shows the presence of a certain element; the height of the step indicates the amount of the element.

From curves so obtained, it thus is possible to tell what elements are present in the sample and also their amounts. So the method can be used for quantitative as well as qualitative analysis, within certain limitations that will be explained.

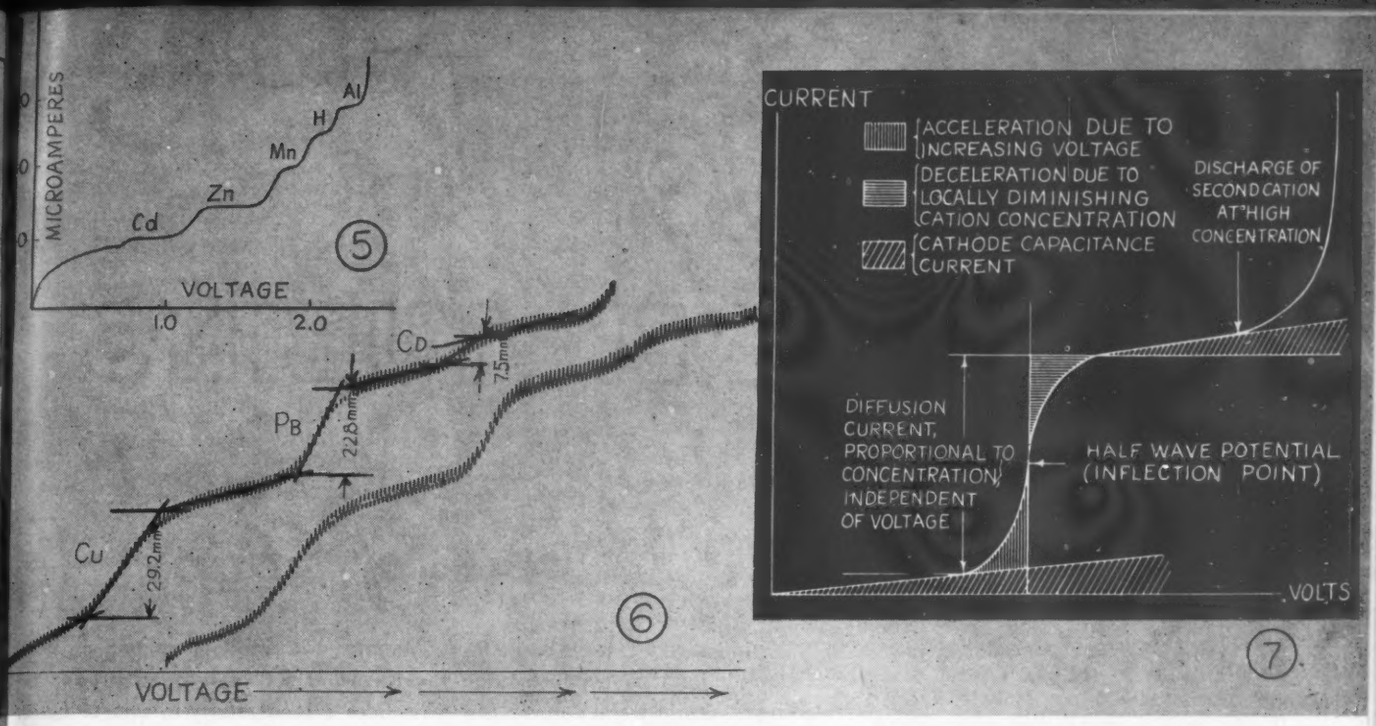
Extremely Sensitive: Outstanding feature of the method is its extreme sensitivity. Reported to have same order of sensitivity as the spectroscope, it has already been employed satisfactorily to determine quantities as low as a few ten-thousandths of a per cent (R. C. Hawkins and H. G. Thode, *Industrial & Engineering Chemistry*, Vol. 16, p. 71, in reporting on the polarographic determination of copper, lead and cadmium in high-purity zinc alloys).

Dr. M. J. Prendergast of E. H. Sargent & Co., Chicago, sole manufacturers of the Heyrovsky Polarograph, explains that use of the method is in its initial stages, as industry is just learning what it can do. Few people realize that it can be used satisfactorily to identify an element when only one hundred-millionth of a gram is present. For quantitative measurements, maximum convenient dilution is 1/100,000 to 1/1,000,000 molar. That means the method is excellent for identifying and measuring mere traces.

Great Precision: Repeated polarographic tests duplicate one another with remarkable precision, even when working with the most minute traces. In fact, Dr. Prendergast reports that the reproducibility of the method is greater than the ability of the operator to measure the curves. The minimum unavoidable measurement errors amount to approximately 1 per cent of the quantity measured, when working under most favorable conditions. Under average conditions, an accuracy of plus or minus 3 per cent of the quantity measured is easily obtained.

Low Cost: An important feature is the very reasonable cost. A complete polarographic setup will run well under $1000 because the equipment involved is fairly simple, as will be explained. This contrasts strikingly with the elaborate and expensive apparatus involved in other methods, which may easily run to many times the above figure.

Compact Setup: Likewise, only a



small work space is required, a few feet of bench in the chemical laboratory being sufficient for installation. And no special precautions need be followed in locating the equipment, the only provision involved is that the bench support be sufficiently free from vibrations as not to jar the galvanometer needle.

Simple Calibration: Use of the polarographic method requires a chemist to put the samples in solution, make original calibration curves, determine which sensitivity setting gives the best curves and supervise routine operation. Where a tested method is available from the literature, two or three days are sufficient for the preliminary work, contrasted to four to eight months that may be required to install and calibrate equipment for other methods.

It is necessary for the plant chemist to make his own calibration curves but these are not complicated. Considerable literature is available on the technology of the method, procedures for use in determining many elements already being available. (See *Polarography*, I. M. Kolthoff and J. J. Lingane, Interscience Pub. Inc., New York).

Range of Application: Since so many diverse types of substances are subject to electrolytic reduction and oxidation (the action that must occur in the electrolytic cell to provide the "steps" in the current-voltage curves), potential usefulness of polarography is quite large.

Kolthoff and Lingane report it has been applied to practically all of the common metals. Recommended procedures have been worked out for the rapid determination of copper, zinc, lead, iron and nickel in brass and similar alloys; the determination of copper, nickel, cobalt, manganese and chromium in steel; the determination of aluminum, zinc, manganese and lead in magnesium alloys. It is useful for determining trace materials in ores, in alloys and in scrap.

(*Please turn to Page* 162)

Fig. 1—Schematic diagram of Heyrovsky polarograph which produces current-voltage curves automatically with the dropping mercury electrode. Motor drives resistor drum which varies applied voltage through desired range. Mirror galvanometer records currents on light-sensitive chart which is geared to resistor drum

Fig. 2—Portion of a polarogram containing a single "step". Height "d" indicates amount present of the element identified by the voltage at the half-way point, called the half-wave potential. Each sharp "wiggle" or jump in the curve represents action occurring as a drop of mercury forms and falls off of the cathode

Fig. 3—Heyrovsky polarograph as made by E. H. Sargent & Co., Chicago, combines all equipment needed to make a polarogram with the exception of the cell containing the dropping mercury electrode which is assembled on the bench alongside the polarograph

Fig. 4—Typical current-voltage curve obtained with dropping mercury electrode, with an air-free solution of 0.0013-molar zinc sulphate in 0.1-normal potassium chloride. Figs. 4 and 5 from "Polarography", I. M. Kolthoff and J. J. Lingane, Interscience Pub. Inc., New York

Fig. 5—Stationary oscillogram obtained by Matheson & Nichols when the drop time of 1/30-second was exactly synchronized with a 30-cycle linear sweep. Solution contained 0.0005-N $CdCl_2$; 0.001-N $ZnCl_2$; 0.001-N $MnCl_2$; 0.0005-N HCl; and 0.0005-N $AlCl_3$ in 0.1-N $LiCl$

Fig. 6—Typical polarograms and method of measuring wave heights. Each "jump" in curves represents action caused by a single drop of mercury. The 150 drops (approximate) here producing each curve represent a total test time of only 7½ minutes, if dropping at rate of one every 3 seconds. From "Polarographic Determination of Copper, Lead and Cadmium in High-Purity Zinc Alloys", by R. C. Hawkings and H. G. Thode, Industrial & Engineering Chem., Vol. 16, p. 71, Jan. 15, 1944

Fig. 7—Analysis of the action producing a "step" on a current-voltage curve. See Text for explanation. Figs. 3, 4 and 7 from E. H. Sargent & Co., Chicago

Producing GAS WELDED TUBING from 2500 pound coils of Strip

Welding head with preheating, heating and welding section is built longer than average unit and thus provides for high-speed production and uniform weld. Double row of orifices extend nearly to end of head. Tunnel in which tubing is given air quench is unique feature of new mill. Final cooling completed by simple water quench

CONSTRUCTION of the welding heads of the new tube welding mill of the Spicer Mfg. Corp., Pottstown, Pa.. marks a most significant development. Each is a 3-torch, 160-orifice unit with a novel division into a preheating, a heating, and a welding section. The length of the head, being more than the average for a tube-welding unit, enables the tubing to pass through at a greater speed with no resulting imperfection in the weld. Points of difference between this and other tube-welding heads developed in the past few years include, in addition to the sectional division already mentioned, the continuance of the double row of orifices throughout all but the last few inches of the head.

The tubing is supported during its progress under the welding head (Fig. 8) by six pairs of water-cooled horizontally positioned conductor rolls set close together to preserve complete uniformity in the shape of the tubing during this crucial stage in its formation. They extend for this purpose about a foot beyond the welding head in the direction of strip flow.

The torches themselves are water-cooled under pressure, and the controlled overflow runs into a water pan behind and above them. Below the rolls are adjustment worm gears for vertical and horizontal alignment, front and back simultaneously. A large hand wheel, not appearing in the illustration, controls the movement of the welding head back and forth across the seam for alignment with it in the event that the coils have appreciable camber differing on each end. Four small hand wheels, three of which are partially visible at the bottom of Fig. 8, control other movements of the torches. One raises the front section of the head which is on a hinge to the right; one moves the head horizontally at the front end, back and forth across the seam; another raises and lowers the whole unit; and a fourth moves the tip forward and backward along the axis of the tube. As demonstrated in Fig. 9, the entire welding head may be completely raised with an overhead cable on a counterbalanced pulley.

Each of the four forming and welding units has its own regulator panel. On the front of the panel are the water, oxygen, acetylene, and compressed air regulators controlling the flow of each to central operations. On the rear of the panel are valves controlling flow of gases to the buttwelding hand torch and the acetylene igniter at the end of the cutoff. A different oxygen and acetylene pressure is used for each of the three torches—the difference in pressure in each instance corresponding with the difference in function between the three sections of the welding head.

The following gas pressures, though subject to small changes at the discretion of the foreman, indicate a working norm for the three torches:

	—Torch Pressures— Lbs. Sq. In.		
Gases	Preheat	Heating	Welding
Acetylene	9¼	9½	7⅛
Oxygen	17	22	17⅛

Immediately after emerging from the welding flames the tubing is given its final cylindrical form by a vertical stand of secondary sizing rolls which compress the weld slightly, forging it in effect. A preliminary quench follows, consisting of two parallel rows of water jets directed upon the areas adjacent to the seam rather than upon the weld itself, in order that the hardening effect of too-rapid quenching may be avoided. The gradual cooling started here is continued

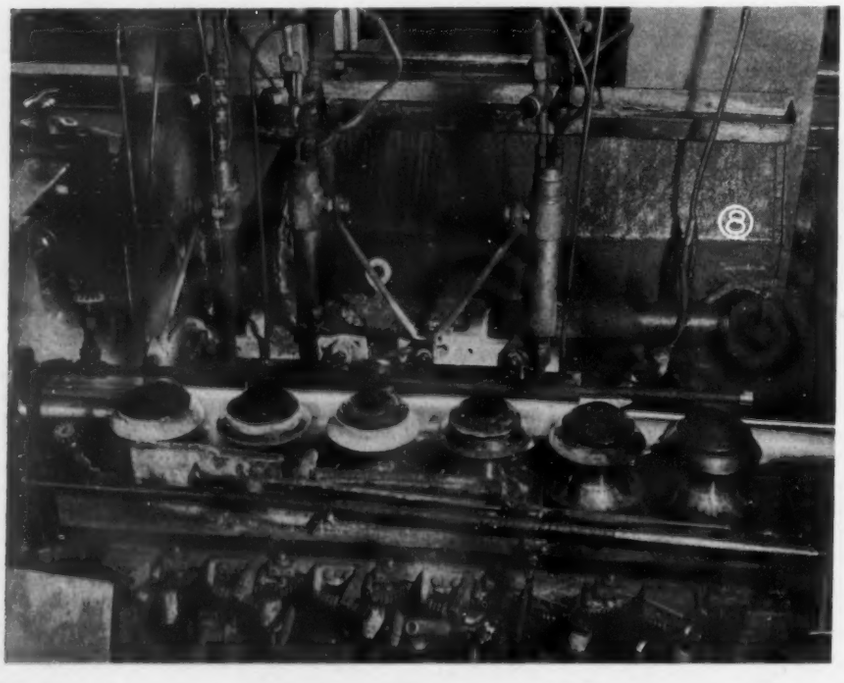


Fig. 8—Six pairs of water-cooled conductor rolls preserve complete uniformity in tubing while passing beneath welding head

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and
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Philadelphia

in one of the most unique features of the new mill, the cooling tunnel or conveyor (Fig. 10) into which the tubing passes next. Compressed air forced into the tunnel is used as an initial quench. The amount used depends upon the hardness desired and upon the carbon content of the strip. Side rollers support the tubing during its passage through the conveyor and keep it rolling without applying any pressure to it.

Final cooling preparatory to final sizing and straightening is completed by a simple water quench (Fig. 11) consisting of seven low-pressure jets, evenly spaced along the line of tube progress for about a foot and directed downwards upon the seam. Water cooling continues between successive pairs of sizing and straightening rolls, which accurately size the outside diameter of the tubing to within commercial tolerances.

An automatic traveling tube cutoff (Fig. 12) of the revolving head type with four blades and cam control, is the next unit in line. As the tube end strikes an automatic trip, setting the cams in operation, a chuck grips the tubing so that the cutoff travels with it while the swiftly revolving blades make the cut. When the cut is finished, a cam actuates an electrically-operated clutch for returning the carriage to its original position. Free gases remaining in the tubing as a result of the welding process are ignited by an acetylene burner as they issue from the tube at each cut. This safety device effectively prevents contamination of the atmosphere.

An expansion test follows on a recently developed machine operating under oil hydraulic pressure. The samples are tested to destruction, the break almost always occurring outside the weld. This test is primarily for the guidance of the mill operator. As illustrated in the closeup, Fig. 13, a hydraulically-operated push rod comes up into

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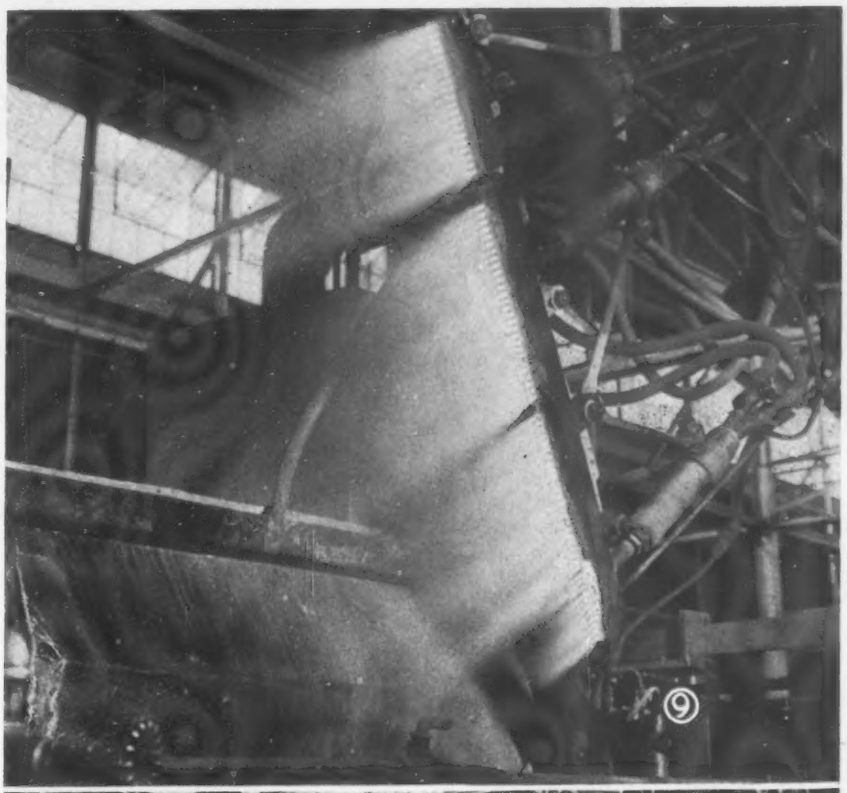


Fig. 9—Tube's eye view of banks of welding flames from three torches with total of 160 *orifices*

Fig. 10—*Side rollers support tubing during its passage through tunnel while compressed air effects gradual initial cooling*

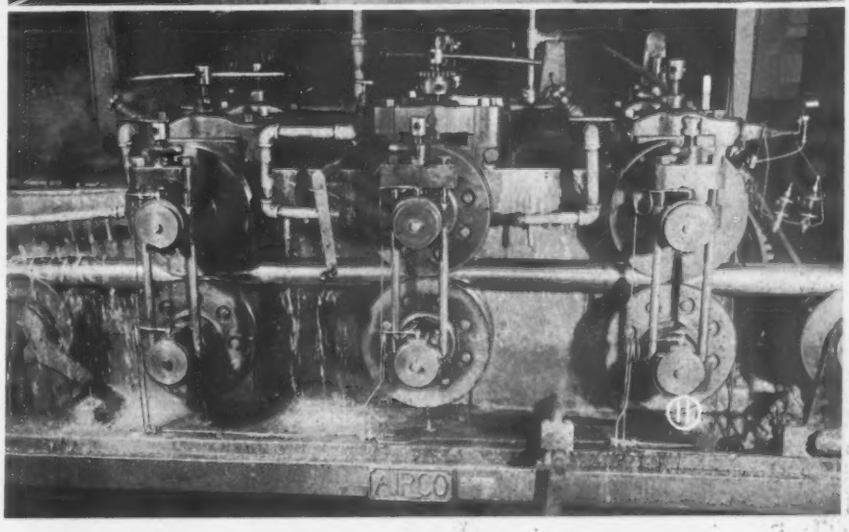


Fig. 11 — *Simple water quench completes cooling and sizing. Straightening rolls bring outside diameter to within tolerances*

Latest Recommended Practice for Checking Commercial Forgings by

MAGNETIC particle method of inspection, in general, is based upon the difference in the ability to conduct magnetic lines of force between iron or steel and most other materials (such as air and nonmetallic inclusions). The permeability of steel may be as much as 1000 or 1500 times that of air, according to the Forging Manufacturers' Association Inc., New York, which has gathered together considerable information on magnetic particle testing as presented here.

Thus, when a magnetic flux is present in a steel object, any crack, inclusion or other area of low permeability will set up a resistance to the passage of the flux. The magnetic lines of force must then spread out in order to detour the area of low permeability. Immediately after passing the area of low permeability, the distorted lines of force tend to resume their normal distribution in the steel.

When the area of low permeability is at or near the surface of the steel, and if the flux density is sufficient, many of the distorted lines of force will leave the steel and enter the surrounding atmosphere in order to "bridge" the area. External magnetic poles will then be produced on the surface of the steel at the areas where the lines of force leave and re-enter the steel. These poles will attract and hold a magnetic particle which is brought to the immediate vicinity.

It will thus be seen that a difference in permeability between the steel and the defects which the inspection is seeking is essential. It also follows that, within limits, the greater the flux density in the steel, the more sensitive will the test be, since a greater number of lines of force will be distorted by a defect of given area.

The permeability of steel is variable with several conditions such as composition of the steel, heat treatment, temperature of the steel, and the flux density in the steel. Extremely high flux densities should be avoided.

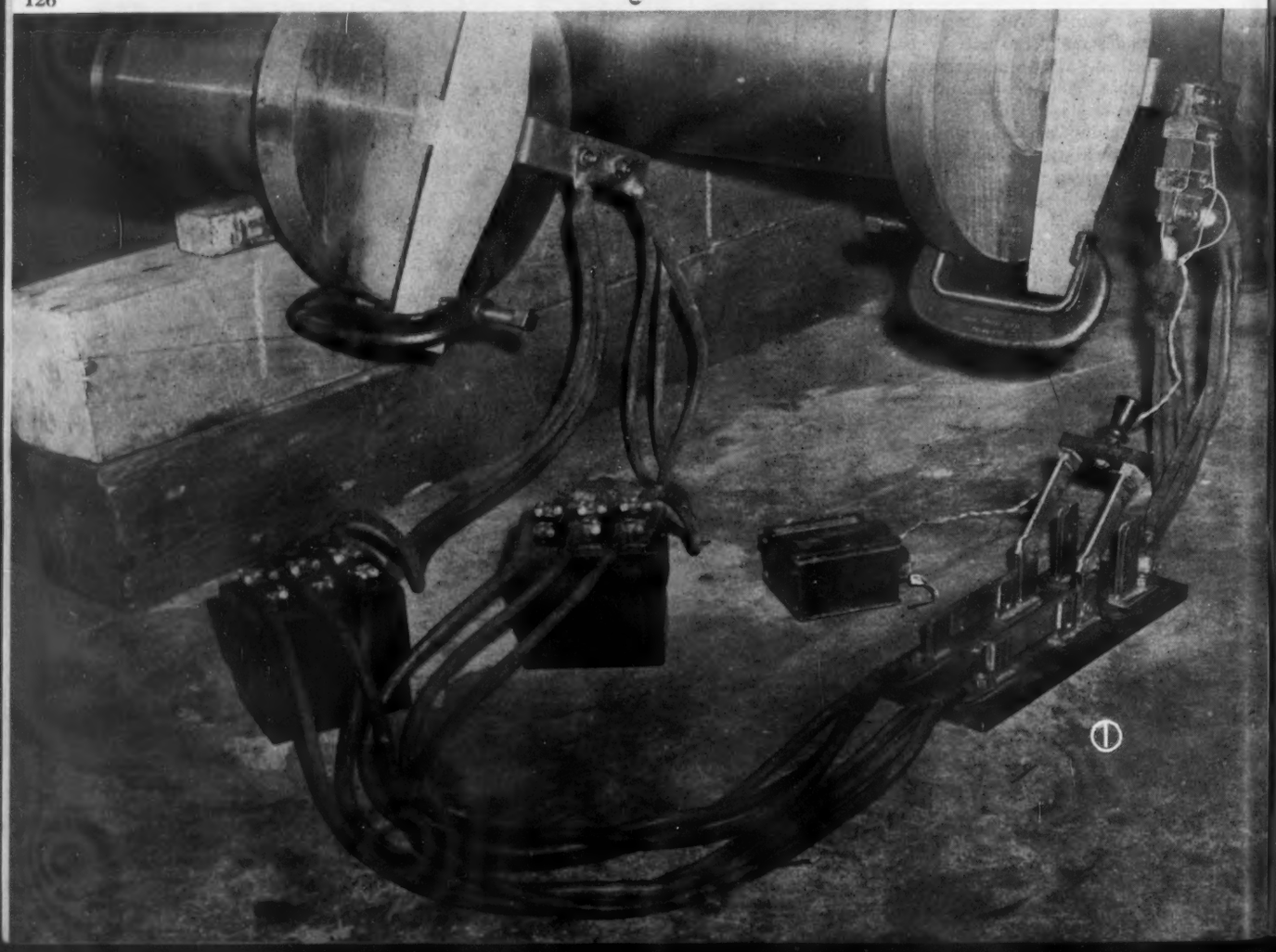
Surface Preparation: The sensitivity of the test will depend to a considerable extent upon the degree of preparation of the surface. Defects in many cases can be satisfactorily revealed on as forged, or on normalized or annealed forgings without any special surface preparation. However, for highly stressed parts such as rotor forgings, the surfaces to be inspected should be smooth machined.

If most of the scale is removed by some methods such as pickling or blasting, the "dry" powder method should be used, and the powder should be dusted into the air and allowed to settle on the forging.

While the "dry" method may be used on both machined and unmachined surfaces, the "wet" method requires a smooth surface for proper application, as it is essential to provide a free flow of magnetic particles over the surface being inspected. In all cases the surface should be free of grease, oils, or other substances to which the powder may adhere.

Magnetizing Equipment: Usual types of equipment for checking large forgings are motor-generator sets, transformers, portable electro-magnets, rectifiers, and storage batteries.

Motor-generator sets of sufficient capacity are not usually available. However,



MAGNETIC PARTICLE INSPECTION

direct current welding generators are probably the most readily available of any of the various types of equipment suitable for magnetic particle inspection. For large forgings, their use is largely limited to the type of inspection employing a coil since the maximum amperage which the usual welding machine will deliver is in the range of 200-600 amperes, whereas experience has shown that proper inspection of large forgings, such as shafting, requires upwards of 800 ampere-turns.

Thus, with a welding machine of 400 amperes capacity, the inspection of a shaft would require a coil of three turns in order to produce 1200 ampere-turns. Direct current welding generators may be used for the "prod" method where the distance between the contacts is limited. The contacts should be clean and solidly made to prevent arcing and burning.

Transformers, while not as readily available as welding machines, offer greater possibilities in the way of high-amperage current for the inspection of solid forgings. As much as 6000 amperes are sometimes used in the inspection of large diameter forgings. However, care should be taken in the use of extremely high currents since wrong indications are easily attained.

When high amperages are available, it is preferable to inspect the forging at lower amperages first and then increase the amperage in steps up to the maximum. In this way it becomes possible to distinguish between indications of surface or near surface discontinuities and those which are more deeply seated.

The current produced by transformers is alternating. The main objection to alternating current is that the magnetic field is largely limited to a "skin effect" on the outer surface of the forging, resulting in failure to locate sub-surface discontinuities. However, for surface or near surface defects such as fatigue cracks, alternating current is considered as efficient as direct current. Alternating current of high amperage often produces a "choke" effect causing magnetic lines of force to follow the air immediately above the surface of the steel, thus producing false patterns which may totally obscure indications of defects.

Electro-magnets are sometimes used

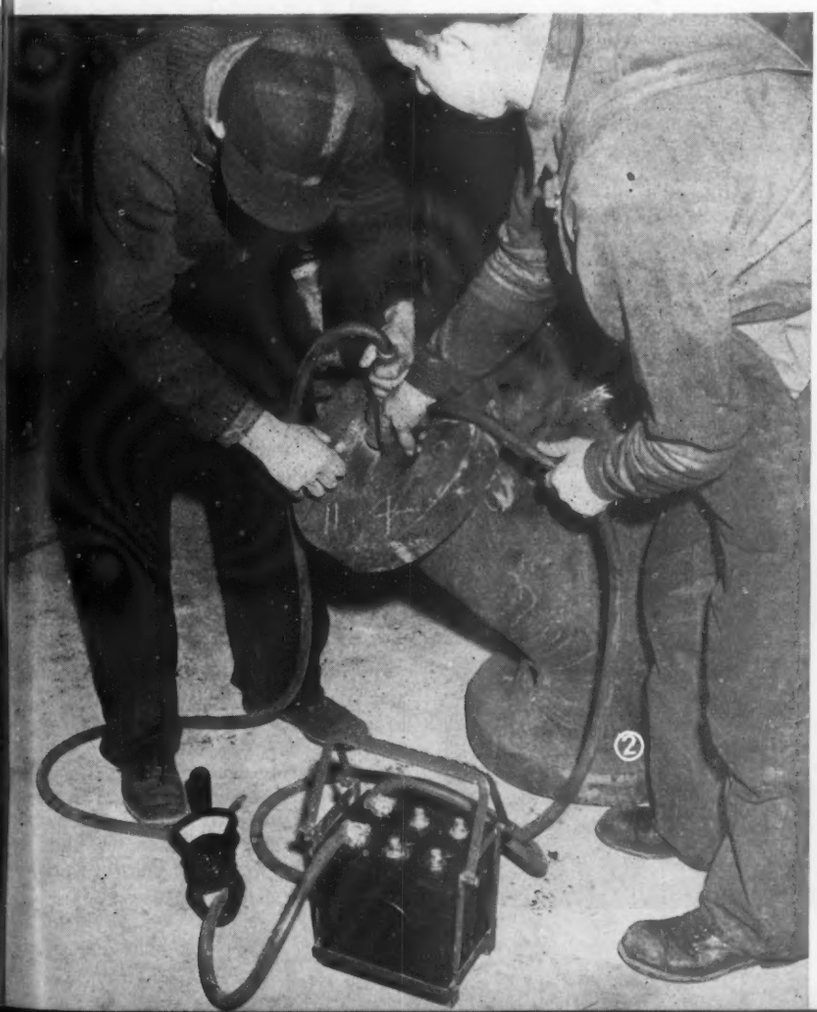
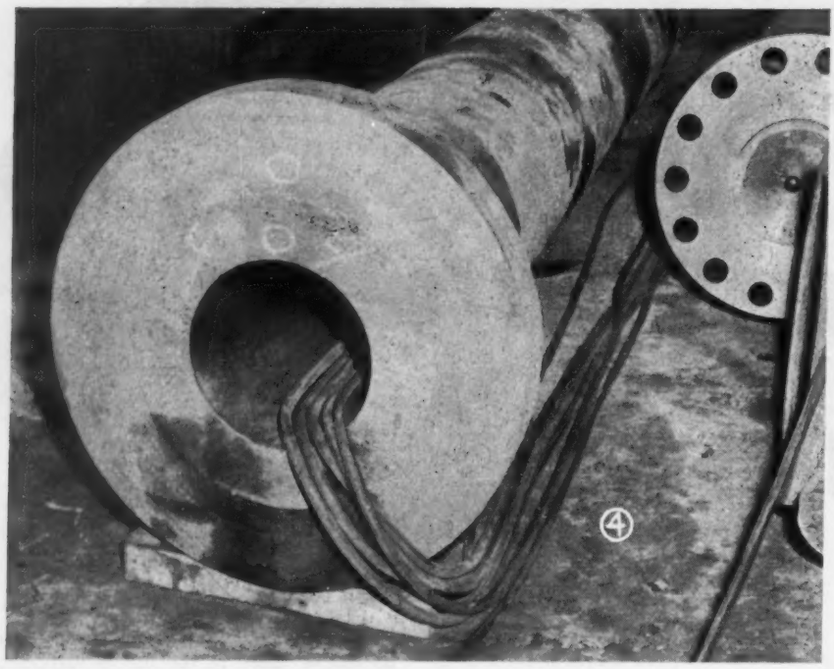


Fig. 1—Producing a circular field by direct passage of current through two forgings in series using storage batteries with cells connected in parallel. Note method of attaching current contacts to the work

Fig. 2— "Prod" method of magnetizing a local area. While storage batteries are shown here and in Fig. 1, power source could be a transformer and a transformer-rectifier unit. All data, photos from Forging Manufacturers' Association, New York

Fig. 3—Coil for longitudinal magnetization especially suitable for detecting transverse discontinuities. Power source could be motor-generator set, welding set, transformer or transformer-rectifier unit



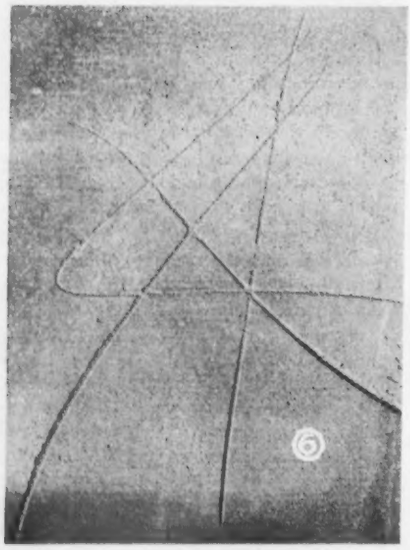
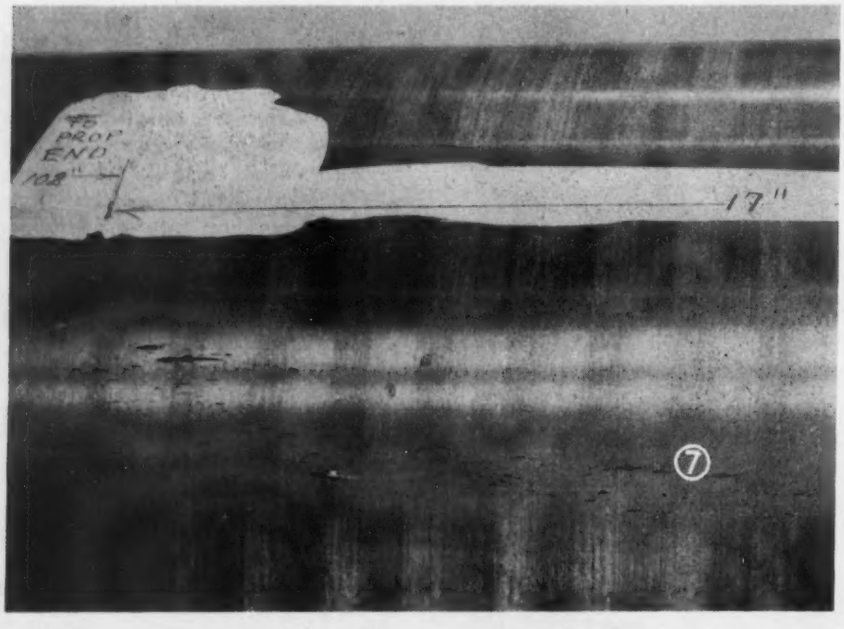


Fig. 4—Here coil is arranged for circular magnetization, most suitable for detecting longitudinal discontinuities. Power source as in Fig. 3

Fig. 5—Indications of inclusions on inner diameter of a bored forging

Fig. 6—False indications due to friction of screw driver blade being rubbed across surface while steel was magnetized

Fig. 7 — Inclusion indications on outer diameter of a turned forging



in the inspection of small parts or in the inspection of localized areas of large forgings.

The yoke magnet is a single electromagnet with a "U" shaped core. When a piece of steel is placed across the ends of the "U", a large portion of the flux between the poles will travel through the steel. Thus, inspection is limited to the area between the poles.

Magnetic pairs produce results similar to that of the yoke. Two separate electromagnets are used, usually with poles of opposite sign contacting the surface to be inspected. Magnet pairs are somewhat more flexible in use than the yoke, since the magnets can be moved about independently of each other.

When a single magnet is used, with only one pole in contact with the surface to be inspected, the magnetic field which is produced extends radially from the pole making contact.

Storage batteries have been found extremely useful for magnetic particle inspection in general, and are particularly satisfactory when used in the inspection of solid shafting. A wide range of current is available simply by the use of the proper number of cells connected in parallel. The cells will deliver 300-400 amperes each and are usually mounted in groups of three. The cells are placed in the case so that all positive terminals are on one side of the case and all negative terminals on the other since the cells are connected in parallel rather than in series.

This type of equipment is inexpensive and is easily moved about from one job to another. If it is desired, for purposes of expediency, an ordinary automobile battery can be altered to produce the equivalent of these batteries. The straps connecting the cells of the automobile battery are cut in the center and the halves of the straps are bent upwards to

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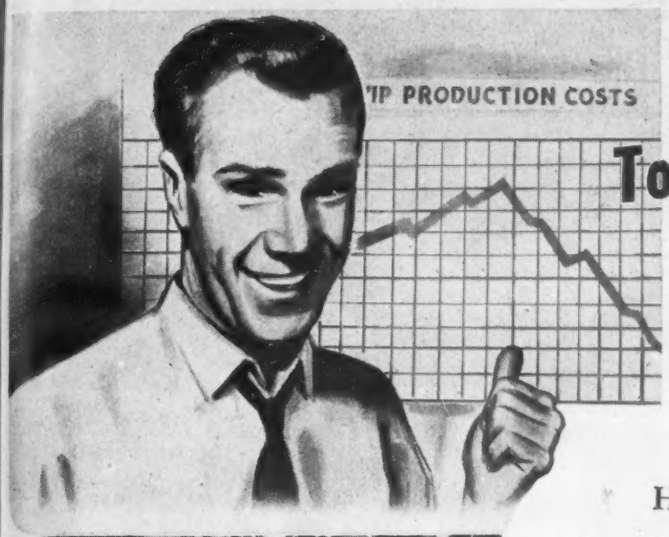
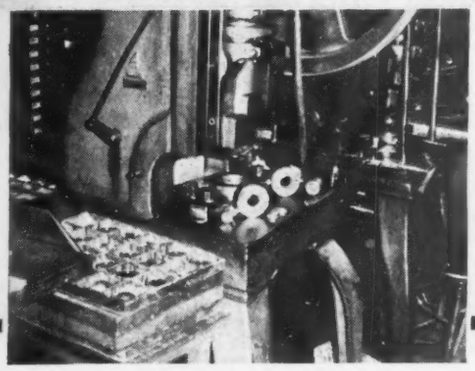


How This Tool and Die Job Analysis CAN BRING DOWN YOUR PRODUCTION COSTS



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Your 2nd Step:

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Your 3rd Step:

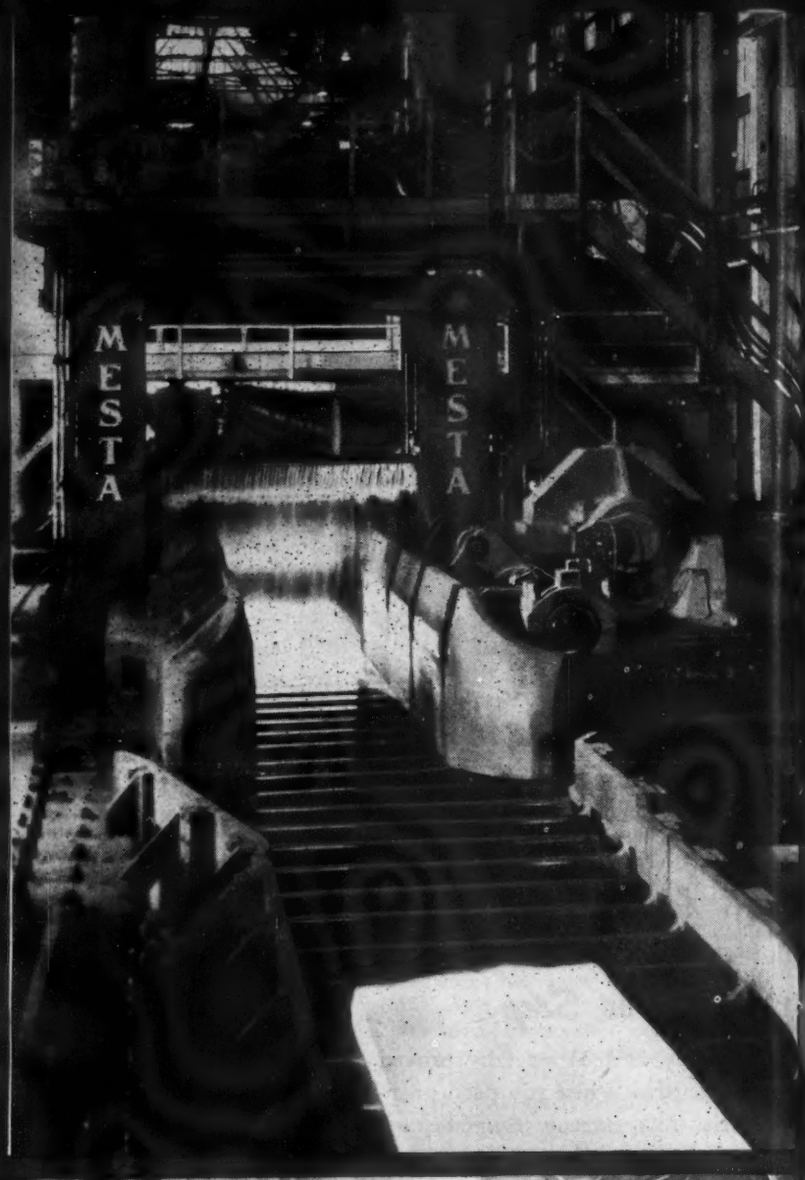
Check actual tool performance . . . as the first step to reducing machine shut-down time. You can cut tooling and production costs by keeping accurate records of the pieces produced between grinds, or before tools must be re-made. It's a sure way to keep tabs on your tool steel selection and heat treating decisions.

HERE'S THE KEY TO YOUR JOB ANALYSIS PROGRAM!

This 167-Page Carpenter "Matched Tool Steel Manual" makes it easier to get every tool made right the first time. It contains an 80-page Tool Steel Selector indexed by kinds of tools. A flip of the pages shows the recommended steel for each type of tool. This Manual is free to tool steel users in the U. S. A., so for your copy, write us a note on your company letterhead.

Carpenter MATCHED TOOL STEELS

The Carpenter Steel Co., 139 W. Bern St., Reading, Pa.



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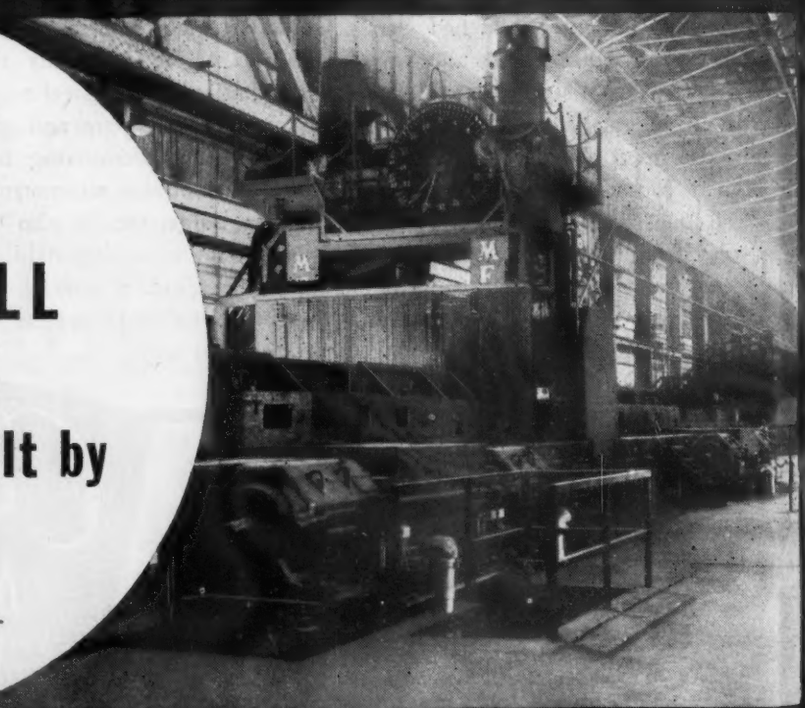

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Supersonic Measurement

Inaccessible surfaces no longer prevent absolute measurement of the thickness of metals. High frequency sound waves afford exceptional accuracy

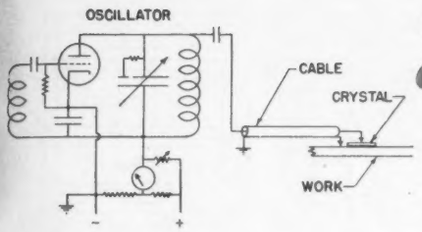


Fig. 1 *(top, right) — Operator pressing quartz crystal held in left hand, into contact with material. Other hand is tuning So igage unit to resonant frequency of the part*

Fig. 2 *(center)—Typical crystal holder and cable*

Fig. 3 *(directly above)—Diagram of the oscillator circuit*

HIGHLY STRESSED parts of modern airplanes make the complete inspection of section thickness after final machining important. This inspection becomes a difficult problem on some finished parts where the inner surface of a wall is not accessible. In some cases, an instrument requiring only external contact to the part is necessary.

The Sonigage, which was developed particularly for the inspection of the hollow steel propeller blades made by Aeroproducts, is such a device. High frequency sound waves, i.e. supersonic vibrations, are used by this instrument to determine the thickness of material. With the Sonigage it is only necessary to have contact with one surface of the section being measured.

The problem of measuring thickness by surface contact is somewhat similar to that of measuring the depth of the ocean inasmuch as the ocean bottom is not easily accessible. In 1921 Behm suggested measuring the ocean's depth by sending a supersonic pulse down through the water and measuring the time elapsed until the echo arrived. Since the speed of sound in water is about 4700 feet per second, the sound would go to the bottom and return in one second when the depth is one-half of 4700 feet. This echo is easily separated from the original pulse until the depth is less than 100 feet, in which case the time interval is only a few hundredths of a second and becomes difficult to measure.

Still shorter intervals are measured with the modern radar equipment which determines distance by the reflection time of a radio wave. Short time intervals are involved because the velocity of such a wave is 186,000 miles per second and thus even a distance of a few miles is equivalent to only several microseconds. The measurement of such small time intervals involves the use of complicated electronic circuits.

Thickness Measured by Echo

A supersonic wave can be used to measure the thickness of metal parts by the echo method. However, with thin sections the time intervals involved are extremely short. This is due to the high velocity of sound in metals, for example, about 250,000 inches per second in steel. Therefore, in a piece of steel ⅛-inch thick, the echo will return in about one microsecond. Complicated electronic circuits are also involved in these measurements.

An instrument which would be suitable for routine production inspection should be simple to operate and inexpensive to build. These requirements led to the development of a different supersonic instrument which is called the "Sonigage".

Principle of Operation: The simplicity of the Sonigage is due to the fact that it does not measure the time intervals directly but rather the frequency at which the work is set into resonant vibration in the thickness direction. Since this resonant frequency in plates of a given metal is directly related to the thickness, the measurement of frequency determines the thickness.

The Sonigage, therefore, consists only of a simple variable-frequency electronic oscillator and a quartz crystal for converting this electrical energy into mechanical vibrations. Their action will be explained in detail later.

Operation of this instrument requires only pressing the quartz crystal into contact with the material and tuning the oscillator dial to the frequency of the work as shown in Fig. 1. Due to internal damping of the metal, power is required to maintain this resonant thickness vibration. This power is supplied by the oscillator. A power output meter serves to indicate the resonant frequency of the work in much the same way as a "Magic Eye" on a radio serves to indicate tuning to resonance with a particular station frequency.

This reasonance point is very sharp and if the oscillator is detuned as little as 1 per cent the indicated power amplitude is greatly reduced. Such sharpness

(*Please turn to Page* 188)

Air Hardenability of Steel

(*Continued from Page 121*)

when the initial heating temperature is 1600 degrees Fahr. It therefore becomes necessary that a parameter for hardenability be chosen. Various hardenability parameters have been selected by various investigators, such as:

(a)—rate past 1300 degrees Fahr. by H. J. French

(b)—rate past 1000 degrees Fahr. by E. C. Bain

(c)—half temperature-time, by M. A. Grossmann

and to these may be logically added

(d)—rate past the knee of the S-curve (this temperature may depart considerably from 1000 degrees Fahr. due to the large quantities of alloying elements in the air hardening steels).

To determine which hardenability parameter leads to the best agreement between the hardness at a given location on the hardenability specimen and the hardness in the size round (A/V) having the same cooling rate past the temperatures of 600, 1000 and 1300 degrees Fahr., comparative tests were made on several air hardening steels (containing about 1.20 per cent carbon, 2 per cent manganese, 1 per cent chromium and 1 per cent molybdenum). These were as follows:

Hardness of these eight experimental air hardening steels were obtained in 4-inch round by 4-inch long cylinders, using a temperature of 1550 degrees Fahr. and soaking times of 20 minutes and 2 hours. These data are given in columns 2 and 3, Table I. This size round has an A/V of 1.5. The cooling rates for a 4-inch round by 4-inch long specimen past 1300, 1000 and 600 degrees Fahr. are as follows:

—1300 degrees Fahr. 58 degrees Fahr./Minute

—1000 degrees Fahr. 32 degrees Fahr./Minute

—600 degrees Fahr. 12.5 degrees Fahr./Minute.

These rates of cooling will be found on the air hardenability specimen at the following distances from the 6-inch slug:

—58 degrees Fahr./Minute 0.12-inch

—32 degrees Fahr./Minute 0.60-inch

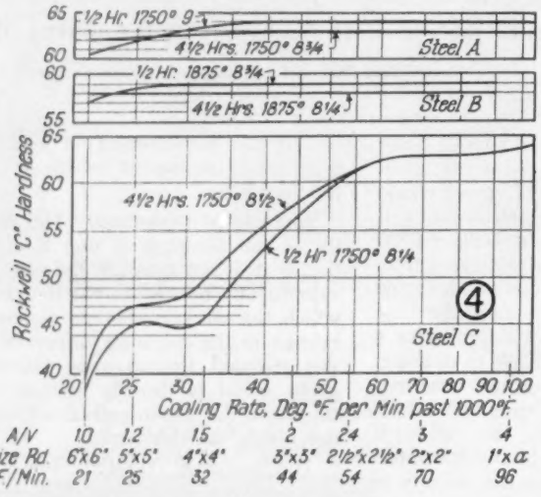
—12.5 degrees Fahr./Minute 2.00 inches

In other words, the above distances are those at which the hardenability specimen cools like a 4-inch round by 4-inch long piece of steel past the temperatures of 600, 1000 and 1300 degrees Fahr. The upper nose on the S-curve for these steels is probably close to 1150 degrees Fahr.

Measurements of rockwell C hardness on the hardenability specimens of these eight experimental steels at the locations given above were made and are shown in columns 4, 5 and 6, Table I. Columns 7, 8 and 9 show the differences between the hardness at these three locations and the range of hardness found in the 4-inch round by 4-inch long specimen for the 20 minutes and 2 hour soaks. These data indicate closest agreement when the cooling rate past 1000 degrees Fahr. is chosen as the hardenability parameter. The 1300 degrees Fahr. parameter re-

Fig. 4—Effect of soaking time on air hardenability of Steels A, B, and C

Fig. 5—Hardenability curves of several of the air-hardening steels


½ Hr. 1750° 9
4½ Hrs. 1750° 8¾
Steel A
½ Hr. 1875° 8¾
4½ Hrs. 1875° 8¼
Steel B
4½ Hrs. 1750° 8½
½ Hr. 1750° 8¼
4
Steel C
Rockwell "C" Hardness
Cooling Rate, Deg. °F. per Min. past 1000°F.
A/V 1.0 1.2 1.5 2 2.4 3 4
Size Rd. 6"x6" 5"x5" 4"x4" 3"x3" 2½"x2½" 2"x2" 1"x∞
°F/Min. 21 25 32 44 54 70 96

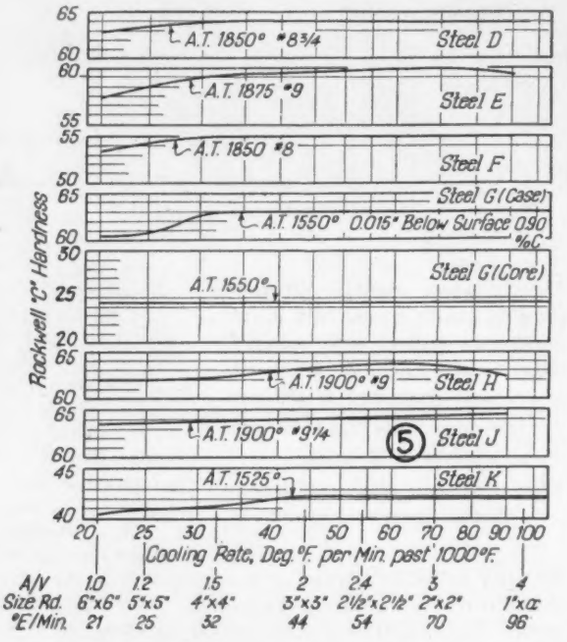
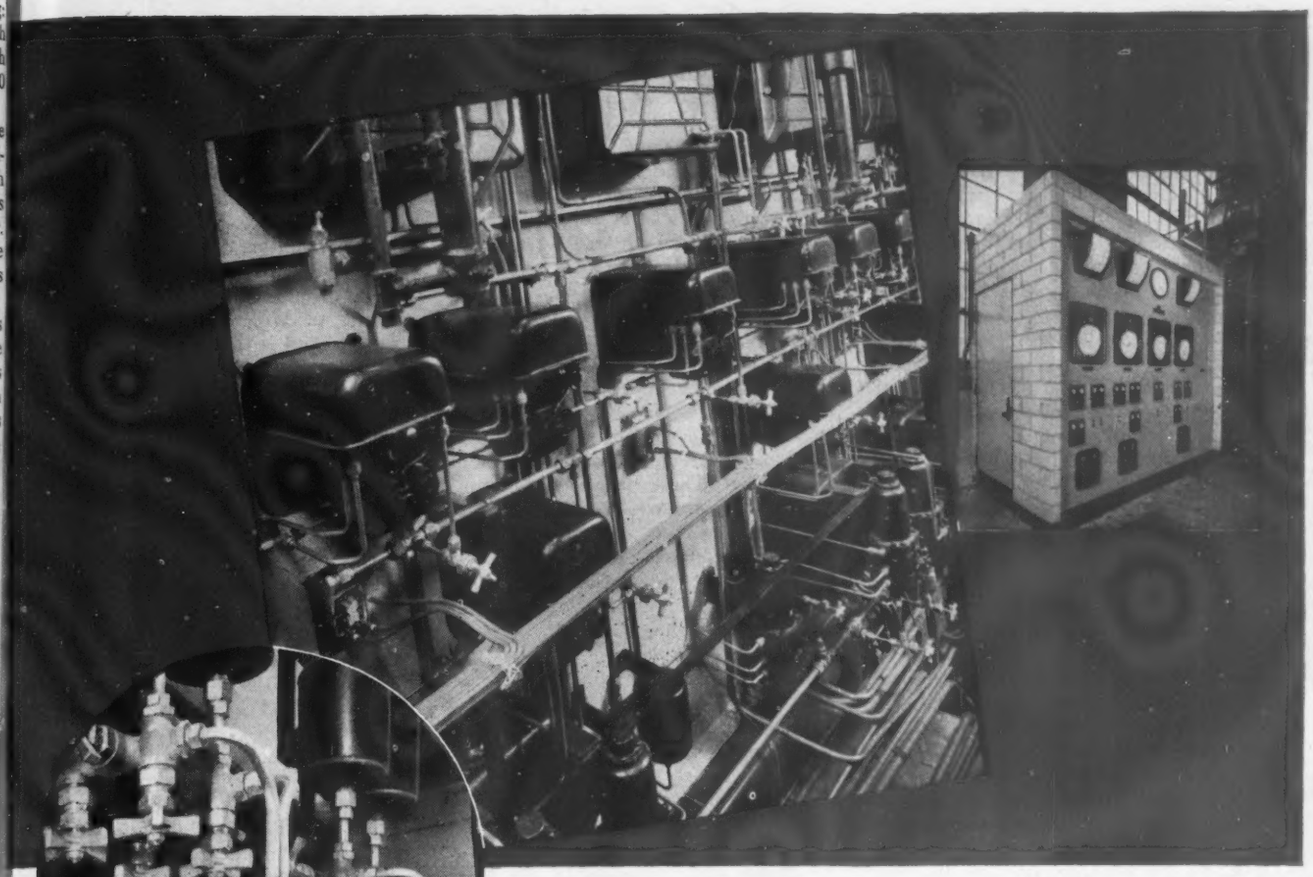
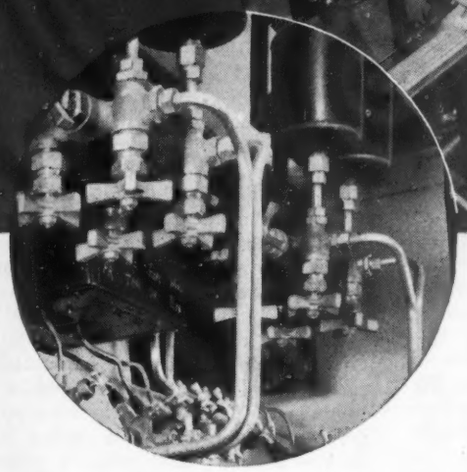


TABLE III
ANALYSIS, TREATING TEMPERATURES AND HARDNESSES ATTAINABLE IN VARIOUS AIR HARDENING STEELS AS A FUNCTION OF A/V

Steel Designation	Per Cent							Hardening Temp. °F.	Minimum A/V for Min. Rc of						
	C	Mn	Si	Cr	Ni	W	Mo		64	62	60	55	50	45	40
A	0.93	0.62	0.24	5.04	0.20	....	0.93	1700	3.0	1.4	1.1	<1.0	....	....	....
								1750	3.0	1.0	<1.0	<1.0	....	....	....
											<1.0/				
								1800	no	no	1.4	<1.0	....	....	....
								1850	no	no	no	no	<1.0	....	....
B	0.39	0.40	0.99	5.10	0.09	....	1.22	1800/1900	no	no	no	<1.0	....	....	....
C	2.16	0.40	0.40	12.00	0.48	....	0.087	1700	no	3.0	2.2	1.7	1.6	1.3	1.1
								1750	3.8	2.7	2.4	2.0	1.7	1.4	1.1
								1800	2.6	2.1	2.0	1.7	1.5	1.1	1.0
								1850	no	2.3/3.3	2.0	1.6	1.2	1.1	1.0
D	1.50	0.35	0.36	12.09	0.35	....	0.83	1850	1.6	<1.0	....	....	....	....	....
E	1.13	0.42	0.34	16.70	0.36	0.02	....	1875	no	no	1.41	<1.0	....	....	....
F	0.35	0.41	0.40	12.90	0.50	....	0.26	1850	no	no	no	1.4	<1.0	....	....
G*	0.104	0.36	0.26	1.54	3.67	....	....	1550	no	1.3	<1.0	....	....	....	....
H	0.57	0.56	0.71	7.45	0.22	7.77	0.15	1900	no	1.0	<1.0	....	....	....	....
J	0.71	0.47	1.17	3.04	0.33	....	5.63	1900	2	<1.0	....	....	....	....	....
K	0.26	0.49	0.17	1.24	4.28	....	....	1525	no	no	no	no	no	no	<1.0
T	0.69	2.09	0.35	1.08	0.15	....	1.57	1550	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

*Carburized 1650° F. 8 hrs.; hardnesses taken 0.015" below surface at about 0.90% C.





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sults in hardnesses on the hardenability specimen which are too low and the 600 degrees Fahr. parameter results in hardnesses on the specimen which are too high, thereby indicating that best agreement can be had by using a parameter somewhere between 600 and 1300 degrees Fahr.

For this reason 1000 degrees Fahr. was chosen, and is used here in the following experiments. Fortunately the cooling rate gradient past 1000 degrees Fahr. is less steep than that past 1300 degrees Fahr. This facilitates locating the hardness position on the hardenability specimen, for as has been shown, the cooling of a 4-inch diameter by 4-inch mass corresponds to a distance of only 0.12-inch from the 6-inch slug when the rate past 1300 degrees Fahr. is used, but is 0.60-inch when 1000 degrees Fahr. is used. (Treating temperature 1600 degrees Fahr.)

Other air hardening steels, such as the high-carbon, high-chromium steels have the knee of the S-curve located at higher temperatures than that of the above experimental steels (Mn-Cr-Mo steels) and perhaps another parameter would be more suitable for this type of steel. To determine this, similar comparison tests were carried out on steel C (Table III). This is usually thought of as a deep oil hardening steel, and so is more sensitive to the influence of size on the resulting hardness. Such a steel amplifies the error in hardness comparisons between the hardenability test specimen and actual rounds if the wrong hardenability parameter is chosen. These data on the high-carbon, high-chromium steel C also are shown in Table I. It will be observed that 600 degrees Fahr. is too low a temperature upon which to base a parameter for hardenability, while either the 1000 or 1300 degrees Fahr. parameter would be satisfactory.

A form of air hardenability chart, based upon the cooling rate past 1000 degrees Fahr., as the hardenability parameter, is shown in Fig. 2. Here 14 rockwell-C hardness measurements are made along the length of the ground hardenability specimen. These measurements are made at locations corresponding to 5 degrees Fahr. per minute cooling rate intervals from 25 degrees Fahr. per minute to 60 degrees Fahr. per minute, and to 10 degrees Fahr. per minute intervals from 60 degrees Fahr. per minute to 100 degrees Fahr. per minute. Hardnesses are also measured at inside end of specimen and at point of entry into the 6-inch round by 6-inch long cylinder. The positions along the specimen at which these cooling rates occur vary with treating temperature, as mentioned previously. These locations for initial heating temperatures of 1600, 1750 and 1900 degrees Fahr. (870, 955 and 1040 degrees Cent.) are shown in Table II. The hardnesses developed at these locations are then plotted logarithmically against the cooling rate.

The above described test has been found to be useful in conducting investigations on the hardenability of air hardening steels. *The test, however, is too laborious for routine investigation of steels as is done with the oil and water hardening grades. As a matter of fact, this is not necessary in air hardening steels, because it is generally sufficient to obtain the hardenability for a type analysis. Due principally to the high alloy concentration found in air hardening steels, the variation in hardenability from heat to heat is negligible.*

Effect of Treating Temperature on Air Hardenability: The effect of treating temperature was determined on the two air-hardening steels, A and B, and the high-carbon, high-chromium steel C (see Table III for analyses of steels). The hardenability assembly was placed in the furnace at 1300 degrees Fahr. and allowed to heat up with the furnace in order to minimize differences in heating rates due to the difference in size of the 1-inch round specimen and the 6-inch round slug. The assembly was held at heat for 45 minutes. The assembly was then removed from the furnace and air cooled. The results are shown in Fig. 3.

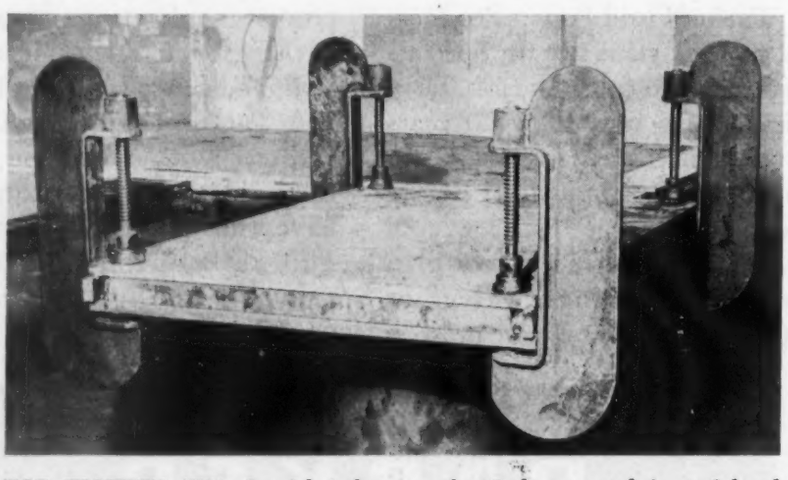
Steel A (Fig. 3) shows a maximum hardness and greatest hardenability using a treating temperature of 1750 degrees Fahr. The center hardness of pieces having an A/V of 1 (6-inch round by 6 inches long) is then 62 rockwell C. The lower treating temperature of 1700 degrees Fahr. appears to be satisfactory for pieces having an A/V of 1.75 or more but in large sizes, the hardness drops off to 59 rockwell C at A/V=1 when treating from this lower temperature.

Austenite Is Retained

When treating from higher temperature of 1800 degrees Fahr. enough austenite is apparently retained to drop the maximum hardness to 60 rockwell C or lower. This maximum hardness of 60 rockwell C is obtained with the larger sizes (A/V=1), whereas at A/V=4 it drops to 59 rockwell C indicating that the slower cooling favors the decomposition of the austenite to martensite. Still more austenite is retained by treating from 1850 degrees Fahr. and like treating from 1800 degrees Fahr. the maximum hardness of 55 rockwell C is obtained at low A/V values, and the hardness drops with increasing A/V to 53 rockwell C at A/V=4.

Steel C, Fig. 3, is considered to be oil hardening, but the hardenability curves show that it will air harden to 63 rockwell C or better in sizes up to 2½ inches round by 2½ inches long (A/V = 2.4 or more) when a treating temperature of 1800 degrees Fahr. is employed. Higher hardness, 64 rockwell C may be obtained for small sizes (1-inch round or less) by treating from 1750 degrees Fahr. instead of 1800 degrees Fahr. This is in agreement with the recommended oil treating temperature for this steel; e.g., oil quenching from 1750 degrees Fahr. yields a maximum hardness of 65/66 rockwell C. Eighteen hundred fifty degrees Fahr. appears to be too high a treating temperature even for air treatment, because sufficient austenite is retained to decrease the maximum hardness to 62 rockwell C. The 1850 degrees Fahr. treating temperature does increase hardness of larger sizes (A/V=2 or less), because, with more stable austenite formed, transformation does not take place in pearlite zone, but more so at temperatures below "M" point than is permissible with lower treating temperatures.

Steel B (Fig. 3) is shown by the hardenability curves to be extra deep hardening and easy to heat treat. This steel, incidentally, is noted as an exceptionally tough air hardening steel. As shown in Fig. 3, it air hardens to 57/59 rockwell C in all sizes from A/V=4 to A/V=1, i.e., from sizes 1 to 6 inches in diameter. The best treating temperatures appear to be 1875 degrees Fahr. for air treat-



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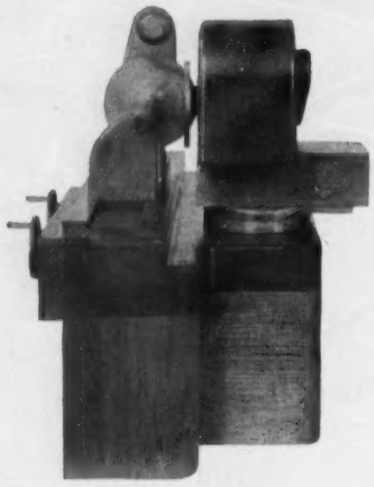
Wooden Model of Grinder Provides Unusual Approach to

MACHINE DESIGN



WOODEN models recently helped to determine the best design for a machine to handle the difficult job of grinding integral wheel and shaft assemblies. No standard grinder with both capacity and versatility to handle the job was available. Four angles ranging from zero to 90 degrees were required on each side of the wheel, and several diameters had to be ground on the shaft. Either a specially constructed machine or a converted grinder equipped with raising blocks and an extra swivel under the wheel head was required.

Quarter-size wooden models of machines proposed for the job were made by both the pattern shop and the machine tool manufacturer. In each of the models the essential parts —the slide unit and its base, swivels, and ways; the table top with its headstock and footstock—were made accurately. For economy, however, the ways were simplified to dovetail or tongue and groove, but were correctly located and marked with limits of travel.

The completed models permit every relationship between wheel and work to be duplicated quickly and accurately to determine capacities and limitations of the machines at the Lynn River Works, Supercharger Division, General Electric Co. Special features of the machines are easily demonstrated. In the accompanying illustration, a quarter-size wooden model of the proposed grinding machine, the auxiliary slide between the wheel head and machine base can be seen clearly.

These models not only helped design a machine for a difficult job, but simplified the training of inexperienced operators for the work. Critical materials and manhours have been saved. The models now are being used to further improve methods and plan new work.

ing larger sizes and 1850 degrees Fahr. for treating smaller sizes (4 inches in diameter or less). Treating from 1800 degrees Fahr. results in insufficient carbide solution and slightly lower hardness. Likewise, the 1900 degrees Fahr. treatment results in hardnesses slightly low, probably due to the retention of austenite.

Effect of Time at Treating Temperature on Air Hardenability: This series of tests was carried out for two reasons: To determine the effect of soaking time on the hardenability of several steels, and to determine what effect this soaking time had on the hardenability procedure, inasmuch as the assembly varies from 1 to 6-inch round cylinders, and consequently the soaking times are different for various parts.

One would normally expect that increased soaking time would act similar to increased treating temperature. Therefore, if the treating temperature at which the soaking time is being investigated is lower than that which produces maximum hardness, the longer soaks should increase the hardness; conversely, if the steel is treated at the temperature which produces maximum rockwell hardness, longer soaks would probably decrease the hardness due to the greater solution of alloying elements and the retention of more austenite.

Tests to determine the effects of soaking times were carried out on the steels A, B and C previously mentioned. These steels were held for ½, 1 and 4½ hours at heat, using temperatures of 1750 degrees Fahr. for the steels A and C, and 1875 degrees Fahr. for steel B. The hardenability curves obtained are shown in Fig. 4.

As shown in Fig. 4C, which relates to the high-carbon, high-chromium steel C, the 4½-hour soak resulted in somewhat greater hardness for the larger sizes (A/V=2.5 or less) than the ½ or 1-hour soak. There is not much difference in hardness between the ½-hour and the 1-hour soaks.

Fig. 4A shows the effect of soaking time on the hardenability of steel A. Although the effect is small, the shorter soaking time of ½ hour results in an increase of about 1 rockwell C point in hardness over that obtained by soaking for 4½ hours. Soaking for 1 hour results in intermediate hardnesses. As shown in Fig. 3, increasing the treating temperature of this steel above 1750 degrees Fahr. results in the retention of considerable austenite with a decrease in hardness. Thus, the longer soaking time of 4½ hours is in agreement with the statement that the longer hold would be similar to increasing the treating temperature.

Fig. 4B which relates to steel B shows that soaking time has practically no effect upon the hardenability. This is in agreement with the results found in Fig. 3 to the effect that change in the treating temperature has practically no influence upon the hardenability.

These tests on the effect of soaking time on air hardenability show that extremely long soaks are equivalent to an increase in treating temperature. However, there is little difference in hardenability when one compares the results obtained from ½-hour to 1-hour soaks. The significance of these results is that the differences in soaking time to be found in the different parts of the hardenability assembly would have little effect on the hardenability results.

Rate of Heating Through the Critical Range: Because the hardenability assembly consists of a 6-inch diameter section and a 1-inch diameter section, the latter would naturally heat faster through the critical range, and the following tests were carried out on steels A and B to determine whether the rate of heating through the critical range has an effect on hardenability.

Steel A was heated slowly through the critical as follows: The gas furnace used was set at 1300 degrees Fahr., the assembly placed in the furnace, allowed to come to temperature, and then slowly heated with the furnace to 1600 degrees Fahr. Following this, the assembly was heated in the normal manner to 1750 degrees Fahr. held at heat for 30 minutes and air-cooled. To obtain fast heating the gas furnace was set at 1600 degrees Fahr., the 6-inch slug placed in the furnace and heated to 1600 degrees Fahr. Then the hardenability specimen was placed in the furnace and heated to 1600 degrees Fahr., and while hot it was screwed into the slug. Following this the assembly was heated to 1750 degrees Fahr. held at heat for 30 minutes, and air-cooled. It was found that the rate of heating had no effect on the hardenability.

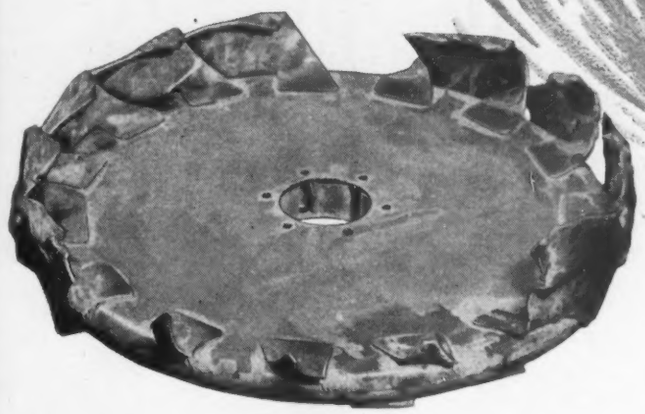
Steel B was similarly treated using a temperature of 1350 degrees Fahr. instead of 1300 degrees Fahr.; 1650 degrees Fahr. instead of 1600 degrees Fahr.; and 1850 degrees Fahr. instead of 1750 degrees Fahr. It was again found that heating rate through the critical had no effect on hardenability.

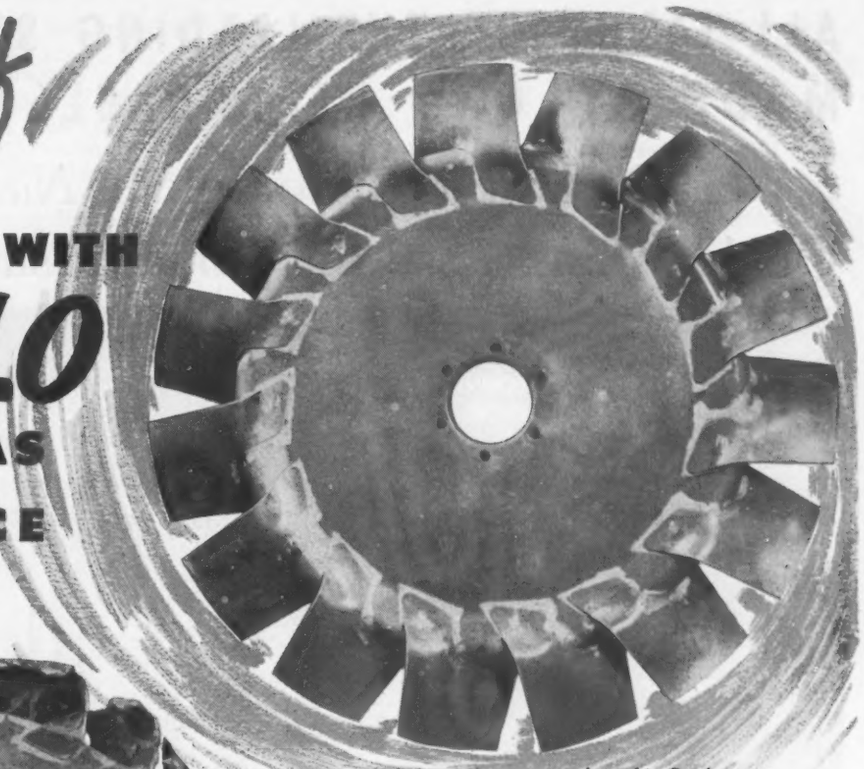
Hardenability of Typical Air Hardening Steels: The air hardenability of some typical air hardening steels (A to K inclusive) are shown in Table III, together with analyses, and heat treatment employed. The hardenability curves of steels D, E, F, G, H, J and K are shown in Fig. 5; those of the other steels in Table III have been presented in Figs. 2 and 3. Table III shows the minimum A/V (largest regular size) which can be hardened to a given rockwell C hardness for a given heat treating procedure.

To illustrate this table, the hardenable

Here's proof

PARTS BRAZED WITH *EASY-FLO* ARE STRONG AS A SOLID PIECE





The 21" steel fan above—used in U. S. Army tanks—is made by brazing blades to a center section with EASY-FLO, the low-temperature silver brazing alloy originated by Handy & Harman. At the left you see this same fan after being tested to destruction at 13,000 r.p.m. The terrific centrifugal force twisted and curled the blades as you see at the left—but the EASY-FLO joints remained intact.

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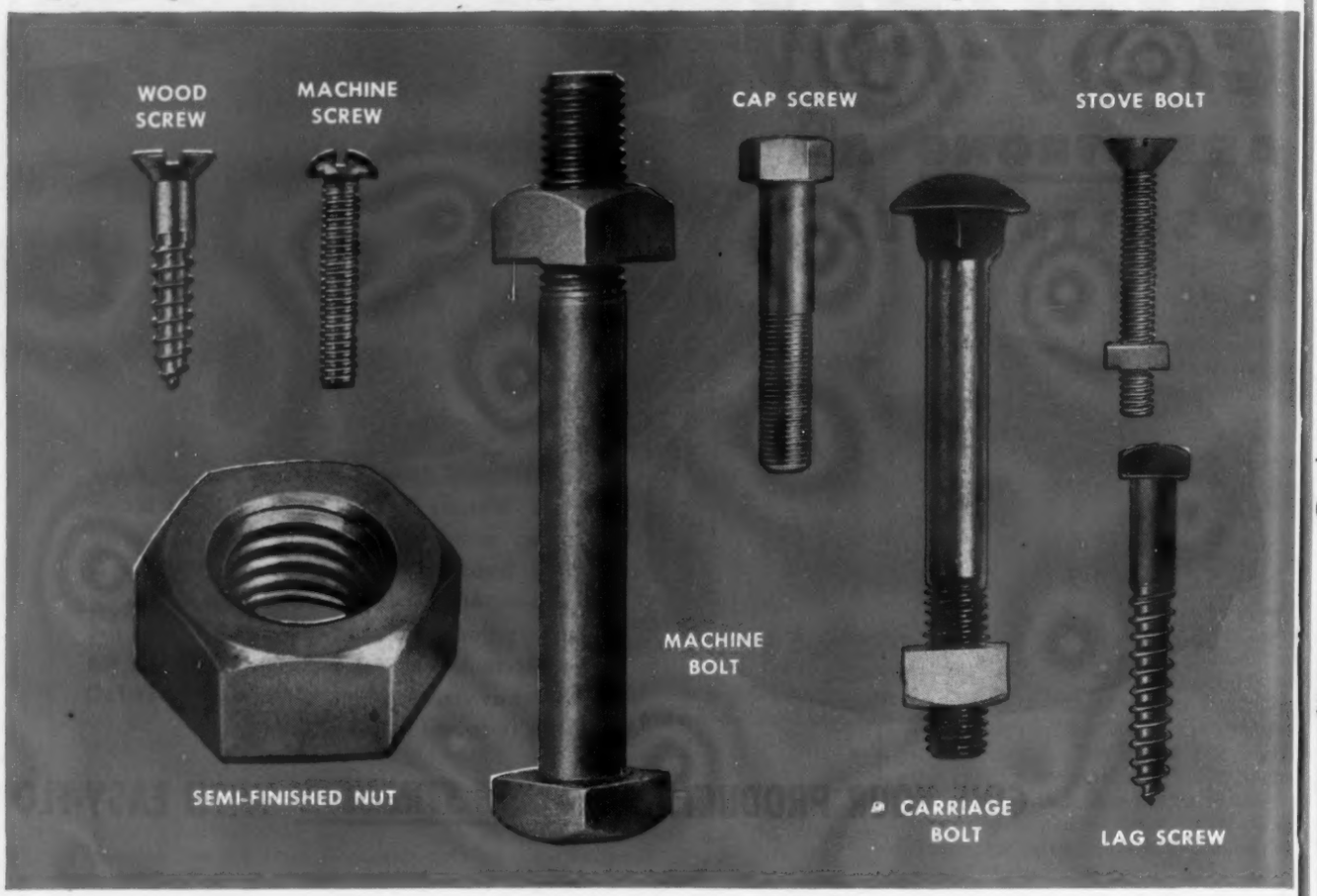


Here's a picture of what builds customer satisfaction and good will—a picture of eight top quality staple fasteners made by *National*.

National Screws are characterized by clean, well centered slots of proper depth, and well formed threads and points. Bolts have well shaped heads, smooth shanks, cleanly defined squares, with nuts that fit properly. Nuts have clean-cut, sharp corners, smooth surfaces, smooth and uniform threads.

To excellent workmanship, *National* adds its famous *Laboratory-controlled Heat-treatment* which assures the tensile strength and durability of the finished fastener.

National
HEADED AND THREADED
PRODUCTS

THE NATIONAL SCREW & MFG. CO., CLEVELAND 4, O.

stainless steel E (Type No. 440) can be air hardened from 1875 degrees Fahr. to 60 rockwell C in all sizes smaller than that which has an A/V of 1.4. This A/V value corresponds to a cylinder about 4 inches in diameter by 4 inches long, or a 4-inch cube. All sizes smaller than this will harden to at least this rockwell hardness. This is true because none of the steels listed in Table III retains more austenite in sizes down to 1-inch round than that which is found in 6 inch rounds.

In applying the data of Table III it will suffice to make an estimate of the A/V value for the piece to be heat treated. In most cases it will generally suffice to neglect small holes, protrusions and small recesses in calculating the A/V value for a die or a tool. In the case of large holes in the tool which contribute substantially to the calculated A/V value these should obviously be included in the calculation. In general, the variation in air hardenability of an air hardening steel is negligible from heat to heat for a given type analysis; consequently the data of Table III should lead to accurate estimates of the hardness to be expected in various size and shape tools made from these types of steels.

Summary: Experimental data show that the center cooling velocity of regular shapes is controlled by the area per unit volume, A/V, relationship, and is independent of treating temperature.

A gradient air hardenability test that is described enables a determination of the air hardening properties of a given air hardening steel to be made, ranging from the equivalent of a 1-inch round by 8-inch long cylinder to a 6-inch round by 6-inch long cylinder (A/V=4.25 to A/V =1).

Air hardenability is stated here in terms of the cooling velocity (degrees Fahr. per minute) with which the steel must be cooled past 1000 degrees Fahr. to obtain a given rockwell-C hardness. The rate past 1000 degrees Fahr. leads to a better correlation between the hardenability specimen and actual rounds and shapes, than the rate past 1300 degrees Fahr. or that past 600 degrees Fahr.

Small changes in hardening temperature have an effect on the hardness of the high-carbon (over about 1 per cent) air hardening steels, but have little effect on the hardness of the lower carbon steels. Small differences in soaking time, such as between ½-hour and 1 hour appear to have little effect on the hardness obtained. Differences of 1 hour and 4 hour soaking time have an effect similar to increasing the treating temperature.

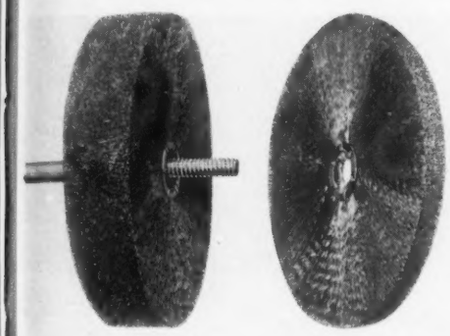
The rate of heating through the critical has a negligible effect on air hardenability probably due to the large quantity of alloying elements present in the air hardening steels.

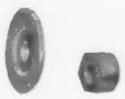
In most cases it is possible to make a good approximation of the A/V value of a tool to be heat treated. Combining this value with the hardenability of the steel to be used, it is a simple matter to estimate with accuracy the hardness to be obtained throughout the tool by air treatment.

Hardenability of several typical air hardening steels is presented in Table III.

In general, the variation in air hardenability of air hardening steels is negligible from heat to heat for a given type analysis; consequently the data of Table III should lead to accurate estimate of the hardness to be expected in various size and shape tools made from those air hardening steels.

Cleaning Varnish from Electric Motor Stators by





POWER BRUSHING

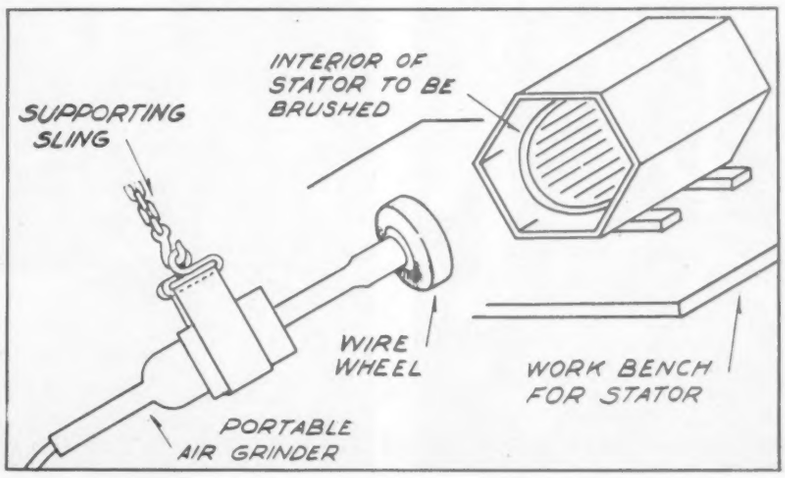
MANUFACTURERS of electric motors are making many uses of power brushing to maintain production for the armed services. One interesting application is in cleaning insulating varnish from the interiors of stators, according to Osborn Mfg. Co., 5401 Hamilton avenue, Cleveland.

Usually stators are not dipped—only the coils. A large manufacturer of electrical equipment has been using power brushing for removing insulating varnish from the stator, as well as for other work. Other typical jobs for power brushing in electric motor production include removing small fins in slots of stators, rust and discoloration from hardened steel rotors, burrs and corners, and removing coatings or lacquer where not wanted.

With past experience in mind, the manufacturer made power brushing part of the production process as soon as the new job requiring interior cleaning of the stator was set up in the plant. The method (see diagram) is to operate the brush in a portable air grinder hung on a sling. The stator is held stationary, either by fixture or its own weight. Brush operates at 3600 revolutions per minute.

Brush shown here is an Osborn-Riehl wire wheel brush, 4 inches in diameter, with a section thickness of approximately $\frac{7}{16}$-inch, filled with 0.003-inch wire. Sections may be mounted on the shaft in the number necessary to secure desired width of face. Brushes are used in sets of three or four.

Stator cleaning is completed in two or three minutes, making short work of the operation. It has the further advantage of blending the metal surfaces by smoothing scratches and blemishes acquired during manufacture and handling.



Gas Welded Tubing

(*Continued from Page* 125)

the tube bottom end and expands it. This 3-inch outside diameter tube is being given an expansion test on a 60-ton press. Several times a day, samples of the weld are taken to the metallurgical laboratory, polished, etched, checked in a photomicrograph machine, and logged in a daily report. In this way an accurate check is kept on the welds in tubing produced during each shift, every day.

From this point on the sections, varying in length from 10 to 18 feet, depending upon the product for which they are being shaped, are moved from one finishing and testing machine to another in a carefully ordered progression. The swaging machine in Fig. 14 brings the ovality and size of the tube to inspection tolerances and provides uniform hardness and stiffness by its peening action. The machine accomplishes this by means of a transmission line consisting of a series of rolls in heads working on center for double hammers. The hammers together comprise a square die with a round hole in the center through which the tubing may pass only by forcing apart the spring-mounted hammers. As the hammers revolve rapidly on a spindle, their outside corners, impinging successively on 16 equidistant, peripheral rollers, are pressed sharply against the tubing by each blow. This strong circumferentially equalized pressure quickly eliminates even the most minute and undetectable out-of-roundness.

A self-driven straightener (Fig. 15) eliminates any longitudinal misalignment of the individual tube sections. It has variable speeds and roller angles to fit the requirements of various sizes of tubing. As indicated by the spiral grease markings, the tube revolves slowly, turned by two large concave driven rollers aided by three small concave idler rollers on a guide beneath the tube.

On a covered hydraulic test bench every length of tubing is subjected to a high-expansive hydraulic pressure ranging from 7200 pounds per square inch for tubing 1⅛ inches outside diameter by 0.062-inch wall thickness to 3250 pounds per square inch for 3½ inches outside diameter by 0.095-inch wall thickness. The smallest tubing must be subjected to the highest pressure in pounds per square inch in order that the fiber stress of the small tube may equal that on the larger tube.

For the test the tube ends are closed with pressure-tight couplings and filled with a rust-preventing soluble oil solution under pressure. The cover is lowered for each test to prevent splashing when an occasional defective tube is found—one weakened by "laminations" due to pipes or other defects in the original ingot.

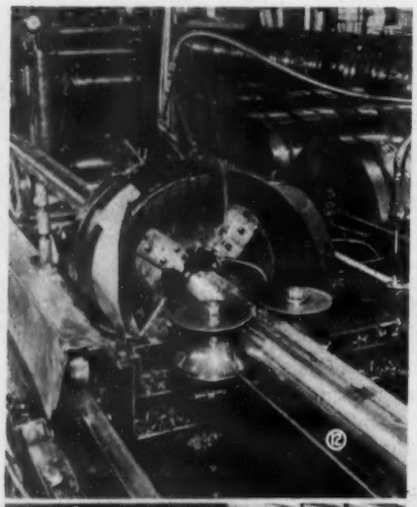
Where the finished part requires taper-swaged ends the lengths pass through a

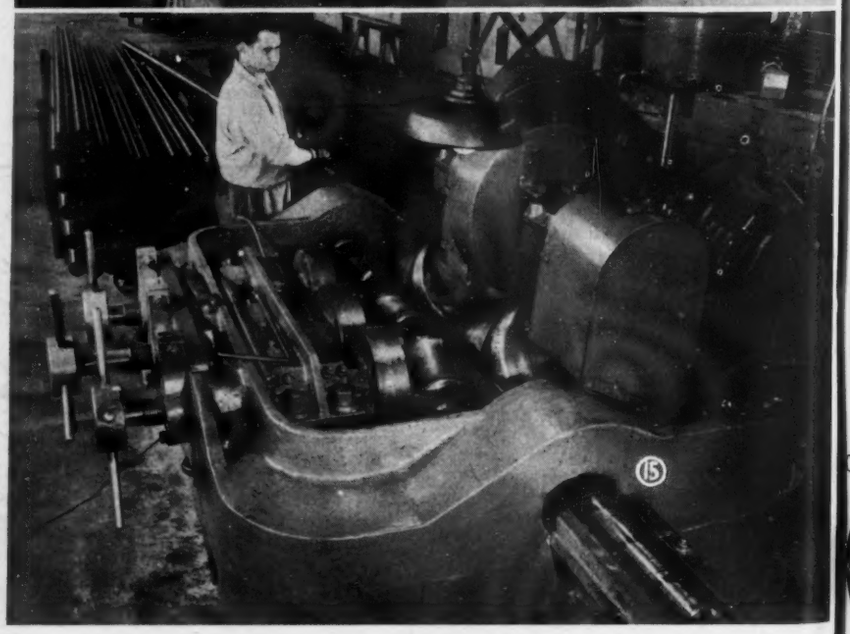
Fig. 12—*Automatic traveling tube cut-off of revolving head type provides sections from* 10 *to* 18 *feet*

Fig. 13—*Close-up of specimen undergoing expansion test to check strength in weld*

Fig. 14—*Swaging machine brings ovality and size of tube to inspection tolerance. Peening action imparts uniform hardness and stiffness*

Fig. 15—*Self-driven straightener eliminates malalignment of the individual tube sections*





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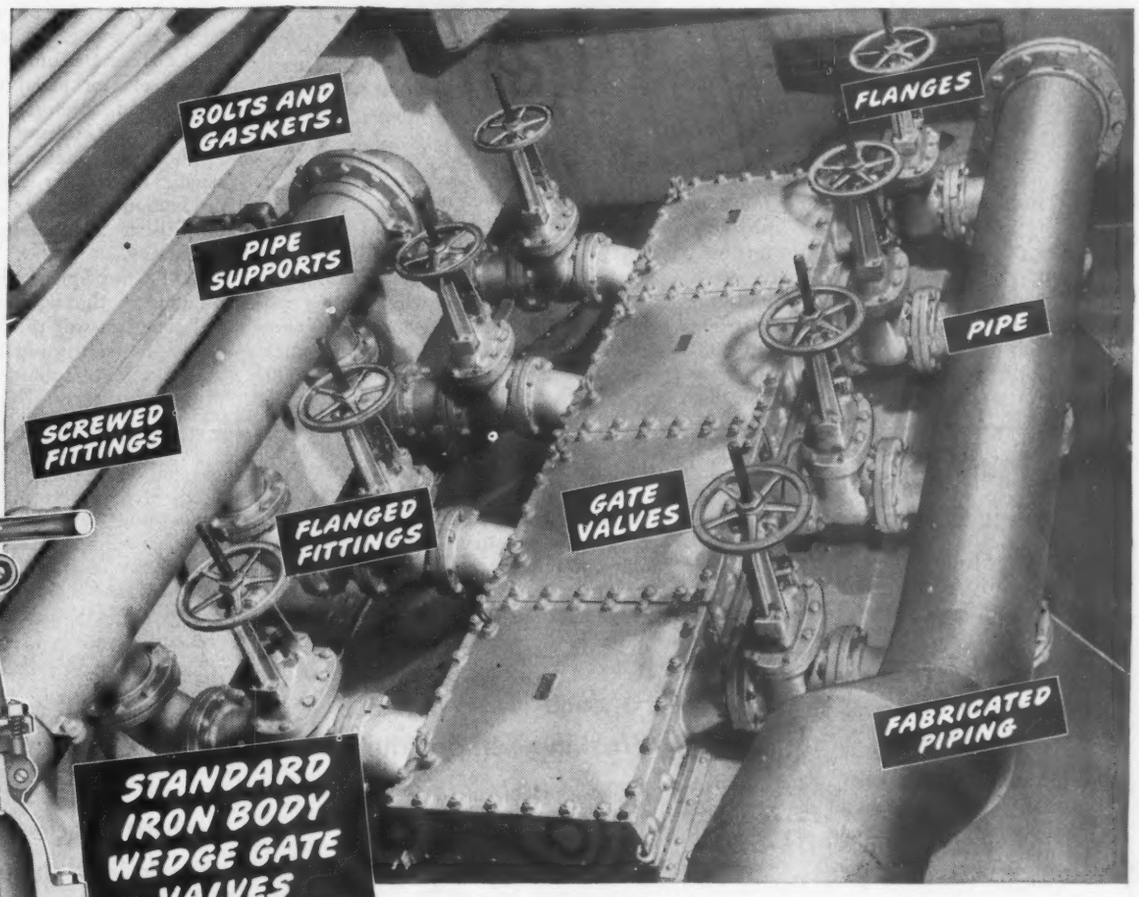
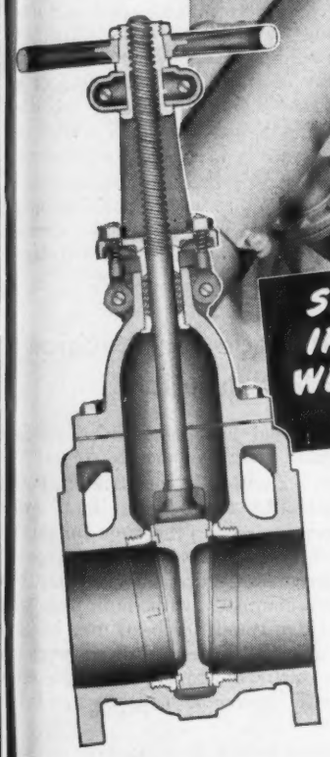
No matter what your need in piping materials... your Crane Branch or Wholesaler can meet it. One order covers all requirements at any time. You choose from the world's greatest line of piping materials—in brass, iron and steel. You help assure the best piping installation because all parts are of uniformly high quality—backed by a single responsibility. Not only do you simplify and speed deferred replacement work by using Crane *complete* piping materials service—but you get full benefit of Crane Co.'s 90-year experience in the piping equipment field.



Water inlet and outlet to generator air coolers in power plant.



STANDARD IRON BODY WEDGE GATE VALVES

SERVICE RECOMMENDATIONS: **Crane Standard Iron Body Wedge Gate Valves** with brass trim are recommended for steam, water or oil lines; all-iron valves for oil, gas or fluids that corrode brass but not iron. Made in O.S. & Y. and Non-Rising Stem patterns.

Working Pressures

Size of Valve	Screwed or Flanged Valves		Hub End Valves
	Saturated Steam	Cold Water, Oil, or Gas, Non-Shock	Cold Water or Gas Non-Shock
2 to 12 in.	125 pounds	200 pounds	200 pounds
14 and 16 in.	125 pounds	150 pounds	150 pounds
18 to 24 in.	*	150 pounds	150 pounds

*For steam lines larger than 16-inch, Crane 150-pound Cast Steel Gate Valves are recommended.

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taper swager. The tube lengths move next to a cutting-off machine with two blade cutters, where the sections are cut to lengths required for specific ultimate uses. Some tubing, however, is shipped out in bar lengths for finishing in consumer plants. The lengths are straightened again on a simple hand-operated straightener, the ends are deburred on a revolving-head type reamer, over which they are held by hand, and the tubes given a visual quality inspection. These shorter lengths must survive the torsional test. Each sample is chucked on both ends and the torque in each direction is measured on the scale shown.

The finished lengths of tubing pass onto the assembly line where joints are pressed into them by hydraulic power to make drive shafts. Assembly is completed in an adjoining building after the tubes are checked for alignment on a hand-revolved axle with dial indicators. Joints are automatic-arc-welded to the ends of the lengths and are sprayed as soon as possible with a carefully selected rust-preventing cooling solution, which prevents annealing or distortion.

The parts are transferred to a torsional testing machine where they are given tests ranging from 3690 inch-pounds for 1⅛ inches by 0.065-inch tubing to 60,000 inch pounds for 3½ inches by 0.095-inch. A 25-ton flexible power press serves as a final straightener for the finished parts. Prior to final inspection, they are placed on a whip testing machine run at speeds of around 4000 revolutions per minute for parts for trucks and passenger vehicles, and up to 13,000 revolutions per minute for aircraft, varying in accordance with the size and intended function of the part. Vibration is measured in this test on a Vitrometer registering in thousandths of an inch. A tolerance of 0.005-inch is allowed.

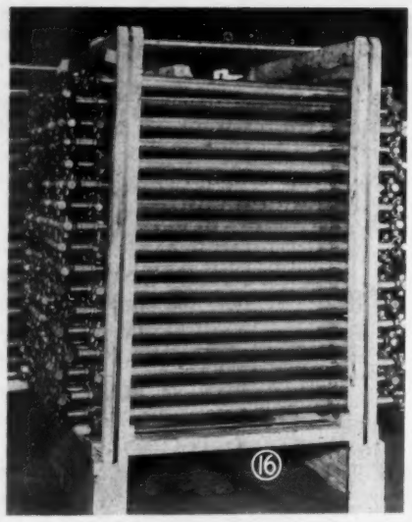


Fig. 16—Finished shafts are packed for shipping so end joints cannot bump against each other. Lift truck crates make handling easier in transit

As shown in Fig. 16 the finished parts are shipped in lift-truck shipping transports which assures easy handling and at the same time prevent any damage by friction, jarring, etc. For shipment overseas to spare-parts depots and repair shops, parts are thoroughly waterproofed. To accomplish this the part is first given a complete covering of paraffin which acts as a base for the waxed seal paper in which it is next wrapped. Over all this is laid another coat of paraffin.

Fully 85 per cent of the shafts turned out here go into fighting machines. Among the types of weapons in which they are employed are planes, jeeps, trucks, reconnaissance cars, tanks, generator sets for naval vessels, amphibian trucks and tractors, Army snowplows, landing craft, armored cars, half-tracks, PT boats, and submarines. Most of the remaining 15 per cent goes into vital production equipment such as special oil-drilling machines and agricultural machinery.

While the Spicer plant is definitely a product of the war and running under full steam in war production, it will certainly go on turning out similar tubing after the war—tubing for the machinery of reconstruction.

Dry Cells Resist Climatic Deterioration

Change from temperate zone conditions greatly shortened the expected life of dry cells in humid tropic heat encountered by allied armies in some areas. They often were exhausted while in storage—and performance of battery powered equipment was unpredictable and unsatisfactory. This resulted in development of a new type of dry cell by P. R. Mallory & Co. Inc., Indianapolis, employing types of materials and methods of constructions never before combined.

Quantity production of the Mallory tropical dry battery has been confined to two battery power supplies for portable U. S. Army and Navy radio equipment. These two battery packs have been built to replace the conventional type dry batteries, and are said to provide four to six times the operating life and longer "shelf life." It is claimed that it will stand high temperatures which seriously impair conventional batteries. Individual cells are hermetically sealed.

Cells comprising the new batteries have what is known as a "flat discharge" characteristic. While voltage in a conventional cell continuously drops throughout operating cell life, voltage in the new cell within practical limits is said to remain substantially constant up to the end of the cell life, thus insuring that equipment using this battery as a source of power will operate at peak efficiency during the entire battery life.

Within rated current range the new cell possesses the same ampere hours' service life whether battery is operated intermittently or continuously, and, according to the company, under usual normal conditions no recovery time is required.

Furnace Has Wide Working Temperature Range

Development of a new, all-purpose furnace to meet the need for modern and efficient production equipment is discussed in bulletin No. 200 by Lindberg Engineering Co., 2444 West Hubbard, Chicago 12. The furnace is designed for silver brazing at low temperatures, copper brazing at high temperatures, powder metallurgy, bright annealing, general tool hardening and high speed tool hardening. Unusual flexibility results from its wide range of working temperatures, from 1300 to 2500 degrees Fahr.

Construction of this new furnace is said to permit handling heavy loads at high temperatures, making its use more efficient for sintering powdered metals where each piece may weigh as much as several hundred pounds. Also, handling work in and out of the furnace is made easier by use of efficiently designed loading and unloading platforms. Furnace shutdowns are forestalled by use of Globar type heating elements that are quickly and easily replaceable.

Hydryzing atmosphere, precombusted gas and dry hydrogen atmosphere may be used for prevention of oxidation and discoloration, providing work that is bright and clean. The furnace is protected from infiltration of outside air by use of a flame curtain at both the charge and discharge doors of the furnace. Curtains ignite automatically when doors are opened. This is a further protection against oxidation. A gas-tight, water-cooled cooling chamber is filled with the proper atmosphere to prevent oxidation and discoloration during cooling.

Height Gage for Precision Work Is Adjustable

A new head has been added to the Electrolimit height gage by Pratt & Whitney, Division Niles-Bement-Pond Co., Hartford. It carries a small lever which permits setting the gage for measuring either up or down, an advantage in many toolroom setups. Gage may be furnished complete with indicator and either of two stands, or head may be obtained separately, permitting owners of the previous model to substitute the new head without replacing the stand or indicator.

Reversing height gage operates on the same basic principle as all the company's Electrolimit gages—translation of a mechanical movement into electrical magnification which produces very sensitive results on precision work. Mechanical parts are made by this company, and all coils and electrical parts are made by General Electric Co.

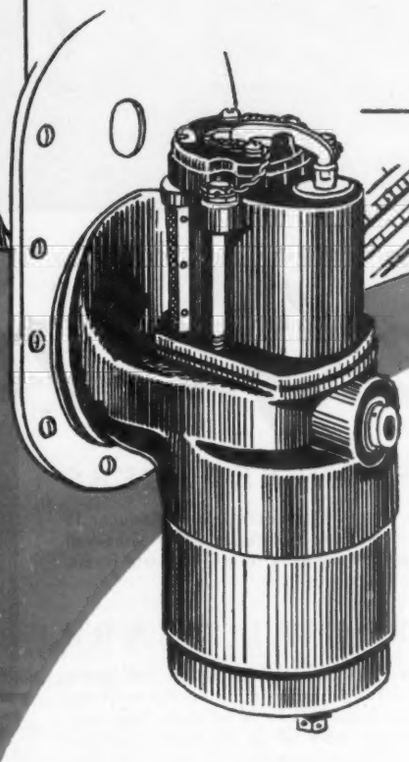
WATCH

for the April Announcement of

A *Fully Submerged*

WATER INJECTION PUMP

by Romec



You have a surprise coming in our April announcement. True to ROMEC tradition, we will announce another ROMEC *First*. That will be a fully submerged Water Injection Pump. A year ago, this was merely an aim. Now it becomes a reality.

ROMEC precision aircraft pumps pioneered in the first "round the world" flights, pioneered the non-pulsating rotor principle, high altitude booster pumps, hydraulic pumps, and the solution to corrosion in water injection systems. Write today if you want us to mail you a copy of the April announcement on the fully submerged ROMEC Water Injection Pump.

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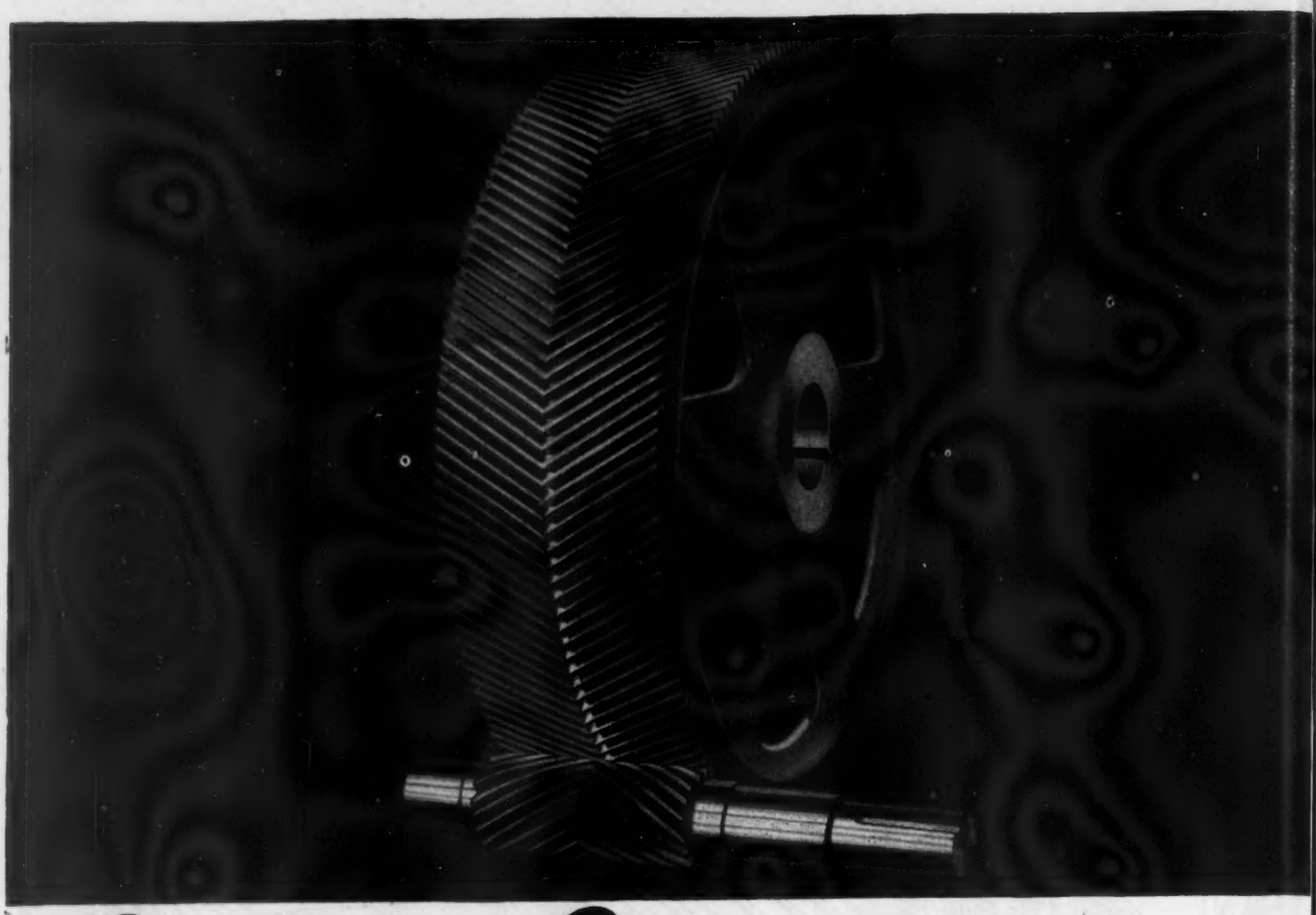
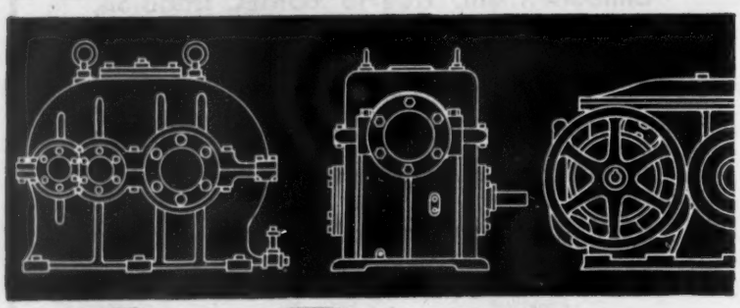
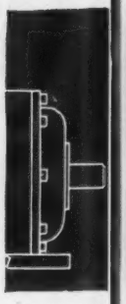


Brad Foote Gears





SPEED REDUCERS

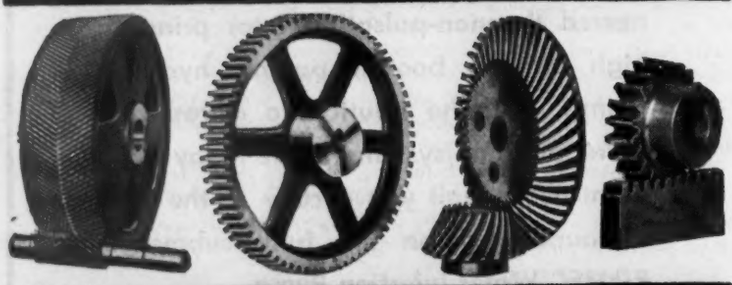
There is a Brad Foote Speed Reducer to fit every need. Made in all sizes—all horse powers—any ratio—all tooth forms.

SPECIAL GEARS

Brad Foote special precision cut gears are fitted for installation on the most exacting jobs. Made in all sizes from any practical material in all tooth forms—Herringbone — Helical — Bevel — Worm and Gear—Spiral Bevel and Spur.

Over a generation of experience goes into every Brad Foote product and extensive plant capacity and shop equipment assure prompt delivery of great quantities of smooth running quality gears.

Write us about your geared reduction problem — full information will be promptly sent you.



BRAD FOOTE GEAR WORKS

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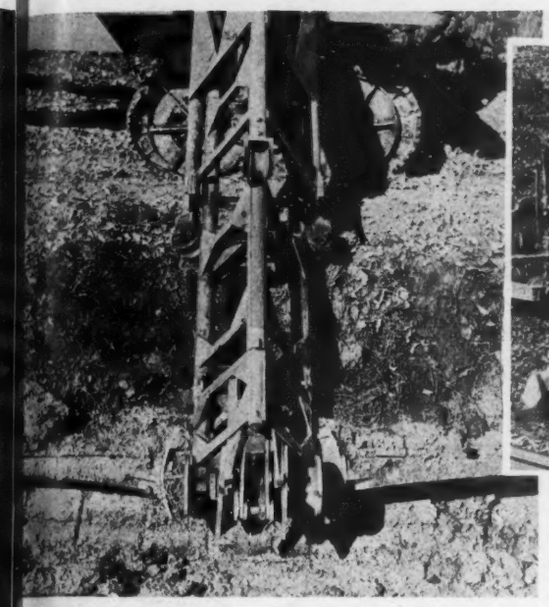
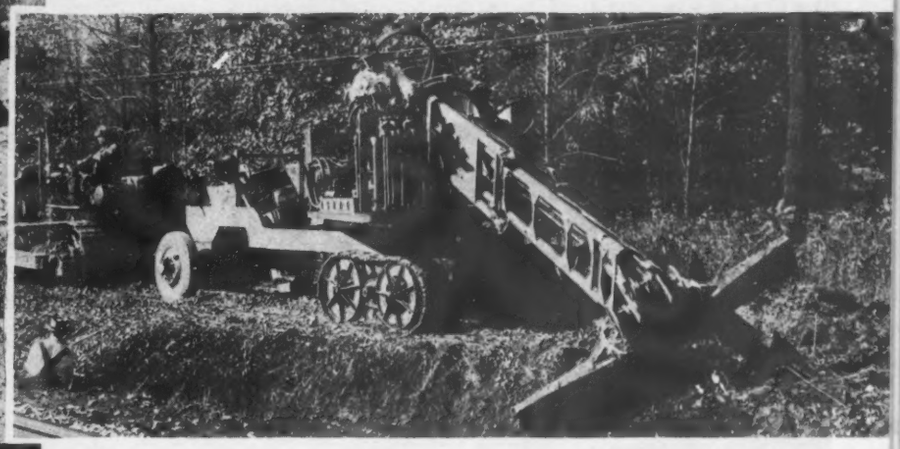




Welded Design Innovations Found in . . . .

New Type Grader Unit

THE SEEMINGLY unlimited possibilities of arc welding in the fabrication of machinery and equipment has brought about radically different concepts in design in many fields of industry.

One particularly interesting example is found in a new unit of construction machine which incorporates features and improvements that would be impossible to attain through conventional methods of uniting metals. Constructed with the assistance of welding engineers of the Lincoln Electric Co., Cleveland, this new machine offers a means of grading and earth-moving that is not only faster and easier, but the work can be accomplished in places that are ordinarily inaccessible to previous types of equipment.

The unit, known as the "Gradall," is a product of the F. W. F. Corp., Cleveland. It is hydraulically operated and employs a unique all-welded boom of telescopic construction which permits the machine to be operated in restricted areas, under low telephone and power lines, etc., adjacent to the working areas.

Illustrations demonstrate the machine in operation clearing drainage ditches along a railroad right-of-way. Note the compactness and low over-all height attained by the use of all-welded construction. The machine and boom rotate through a complete arc of 360 degrees. The boom when extended is 24 feet long and may be elevated 27 degrees or lowered 45 degrees.

From the outset, the individual parts of this machine were looked upon by the manufacturer as an arrangement of steel pieces to fit the design. Structural members including plates, tubing, angles, channels and other metal shapes were studied to determine the assembly of parts that would best meet functional requirements.

A typical result of this type of analysis is indicated in the boom construction, Fig. 1, which shows how tubular members and reinforcing steel parts were used to obtain the triangular, telescopic design which permits the boom to be extended up to 12 feet. The boom assembly consists of two main triangular assemblies, one telescoped within the other and hydraulically actuated so that the inner assembly can be moved in or out of the outer assembly, riding against a set of three rollers shown at the center of Fig. 1.

Both boom assemblies are carefully reinforced at points of stress. All excess weight has been eliminated wherever possible without sacrificing strength and rigidity. Welding was done with work generally positioned flat, using large size, ¼-inch electrode, single pass. The boom is anchored to the revolving platform on which is mounted a 50-horsepower gasoline motor, gas tank and all controls for the machine.

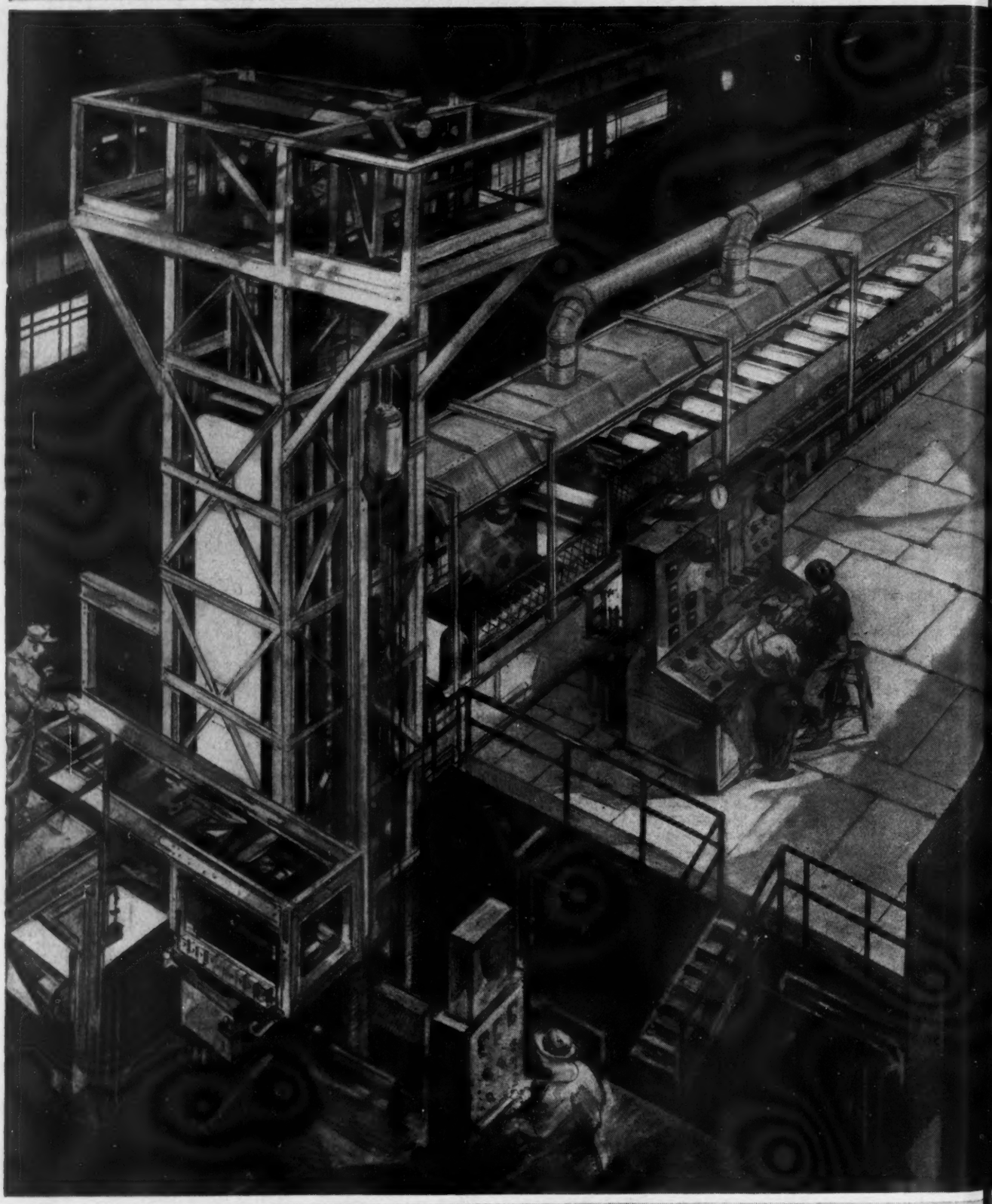
For general grading or ditch cleaning operations, an 8-foot wide cutting blade is swiveled on the end of the boom and controlled so that it can be tilted inward toward the machine to retain a load of loosened earth. The operator then raises the boom with the loaded

(*Please turn to Page* 194)

Fig. 1 (*Top, left*)—*Telescoping boom, hydraulically actuated, can extend* 12 *feet to total length of* 24 *feet, revolve* 360 *degrees in horizontal plane and be elevated* 27 *degrees and lowered* 45 *degrees*

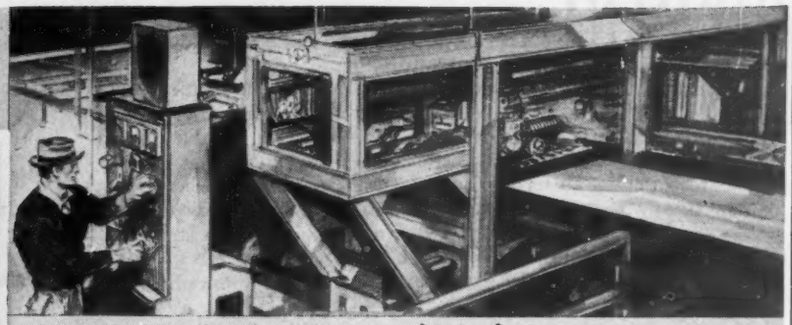
Fig. 2 (*Top, right*)—*Blade can be tilted in any position required to scrape loose earth away from edge of ditch*

Fig. 3 (*Directly above*)—*Machine can straddle ditch and clean out with V-type bucket. Knuckle action of end tool digs up earth, holds it while boom is lifted out, then dumps over edge of embankment or onto truck*



Electrically plating steel strip with tin

FROM AN ORIGINAL DRAWING AND SKETCHES MADE AT J&L ALIQUIPPA WORKS BY ORISON MACPHERSON



Steel strip entering electrolytic lines

TINPLATING METHOD BORN OF THE WAR

Capture by the Japs of the tin mines in the Malay Straits Settlements forced rapid development of tinplating equipment to make what tin we had go farther, and still afford complete protection to foods, fruits and other products packed in tin cans—the best all around container.

The best method available proved to be the electrolytic tinning process. The steel industry with the cooperation of the can manufacturing and closure industries developed electrolytic tin-plating and units were installed all over the country.

The new process electrically deposits tin upon continuously moving steel strip in rigidly controlled plating thicknesses, and does it speedily, evenly and thoroughly. It saves up to 67% of the tin required for tinplate, as compared with the hot-dip process. A war economy now, the new process promises good things when tinplate comes back in abundance for domestic use.

JONES & LAUGHLIN STEEL CORPORATION

J&L STEEL

PITTSBURGH, PENNSYLVANIA

CONTROLLED QUALITY STEEL FOR WAR AND PEACE

Tinplate emerging from electrolytic unit

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TIN CONTAINERS

Cans and fighting men are inseparable. The soldiers' principal reliance for food is upon the tin can. Special rations are packed in tins. The "provision bomb" is a tin container of food to be dropped to survivors at sea or surrounded soldiers. Gas masks, flares, Very pistols, bomb fuses, smoke signals in colors come in tin cans; so do ammunition, fuels, lubricants for tanks and planes, blood plasma, life-saving devices, drugs and dressings. So, while the family tin can for many products has taken a leave of absence, the production of cans for foods has been greater than normal —an estimated 250,000,000 cases of canned fruits and vegetables in 1944.

Minerals and vitamins are better protected and retained by modern canning methods than by the most commonly used home-cooking methods, due to modern canning practices that make use of procedures developed to protect vitamin and mineral content of food.

Food kept in open cans is just as safe as taking it out and putting it in a dish or bowl, if can is kept cool and covered, states a recent release of the U. S. Dept. of Agriculture. "Cans and foods are sterilized in the 'processing'," says the statement, "But the dish into which food might be emptied is far from sterile."

Discoloration inside cans is entirely harmless. It is caused only by the sulphur present in some foods, just as the sulphur in a cooked egg will discolor silverware.

No preservatives in canning, since canned foods keep for years because they have been heat-processed in sealed containers.

Liquid in a can of vegetables is the juice in which the food is cooked in the can. Whenever possible, this liquid should be cooked back into the food or used for soups or sauces. It contains soluble food values such as certain minerals and vitamins extracted from the food.

Lithography on cans. The use of attractive design and brilliant color on tin containers for cakes, candies, confections and countless toilet and beauty preparations, will return after war more attractive than ever.

China invented sauerkraut, not Germany, according to an official of the American Kraut Packers Association, whose research revealed sauerkraut was fed to laborers on the Great Wall centuries ago to combat vitamin-shy diet. The American canned sauerkraut crop last year exceeded 3 million cases.

Home-canning jar tops are a product of the closure industry. Victory gardeners this season will use them by the millions. They will be made with electrolytic tinplate. Other tin closures are the familiar tops of bottles, cans and jars.

INDUSTRIAL EQUIPMENT

Pneumatic Saw

For ripping metal sheet to 3/16-inch thick, steel, brass, aluminum, etc., Cleveland Pneumatic Tool Co., 3781 East Seventy-seventh street, Cleveland 5, announces the new Cleco pneumatic baby saw. It will cut 1/16-inch steel at the

rate of 1 inch per second, on a straight line, or curved, leaving edges free from burrs. The tool uses a saw of special steel, specially heat-treated for the work. It weighs 2¾ pounds and is about 8 inches long.

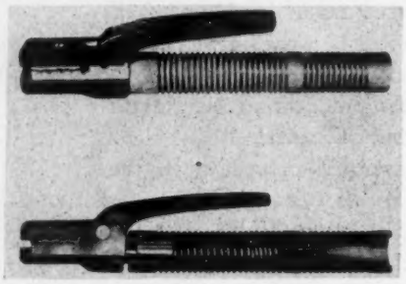
Impact Wrench

Operating with controlled torque, a new ¼-inch impact wrench has been announced by Aro Equipment Corp., Bryan, O. This tool is designed to eliminate stretching or "burning" of threads in setting nuts, bolts or Phillips screws. It is capable of both forward and reverse rotation and has a calibrated adjusting screw on the side of the motor that enables the operator to set any bolt, nut or screw to any desired tension.

Torque control is obtained through the roller clutch impacting mechanism, consisting of four parts. It is a combination of the construction of impact mechanism and the flow of air through the tool that enables the operator to set the bolt, nut or screw to any torque. The model 106 is particularly adaptable for use in driving Phillips, Reed and Prince or Allen head screws. The action of the impact mechanism is such that while it drives the screws to the necessary tightness, it will not tear the head of the screws or break the bits.

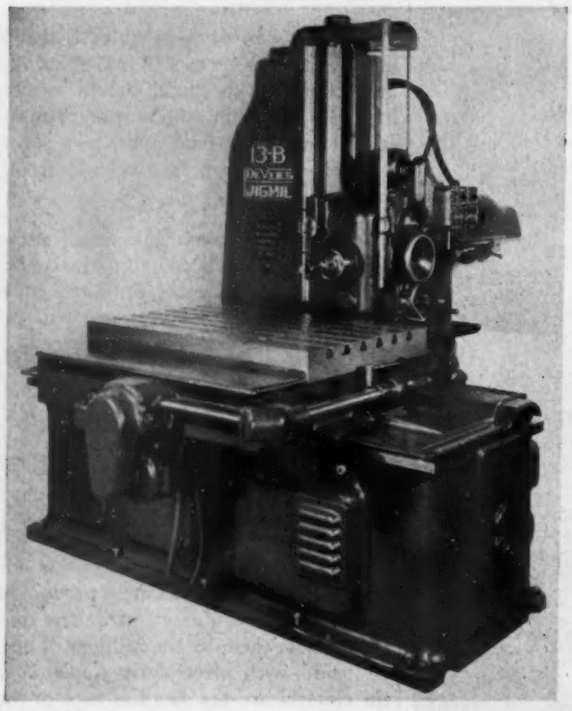
Electrode Holder

Known as Mor-Weld, Pacific Engineering Corp., 3123 San Fernando road, Los Angeles 41, is now marketing a new type of electrode holder. It has a heat resisting plastic jaw cover. Its flexibility enables the welding rod to



be consumed down to a stub without the necessity of bending. Grip holds all rod sizes. Lever action jaws can be replaced in less than a minute without tools. All parts are interchangeable because there are no pins nor bolts.

The handle is made of plastic. The holder is "air conditioned" and keeps cool under continuous operation.



Milling Unit

DeVlieg Machine Co., Ferndale, Mich., introduces a new model 3-inch bar Jigmil. Among the new features is automatic positioning which makes it possible to automatically position the spindle and table from one location to another accurately to within 0.0001-inch in response to precision end measuring rods and push buttons. Another improvement is the new type of feather touch controlled pressure locking means that firmly locks the slides with a controlled uniformity. This affects the uniform treatment of the oil film and prevents errors of manual locking.

The automatic table retraction feature has been improved for accuracy. Retraction of table and work from the cutting position is the result of push button control which unlocks the table, retracts the desired distance from the cutting position and automatically returns stopping and locking accurately in the cutting position to within 0.002-inch. Finger tip control renders all functions of the machine operative from one position. This control station is mounted on the spindle head.

The spindle has been made heavier and the spindle head dimensions increased. The gear train has been improved. There are five motors and all motor mountings are accessible. The machine has 24 spindle speeds from 22 to 1200 revolutions per minute. Bar feeds are in thousandths per revolution from 0.001 to 0.016-inch. Milling feeds to the table and head are in inches per minute selected with a dial quick change mechanism providing a range from 0.3 to 15 inches per minute.

Internal Gear Checker

National Broach & Machine Co., Detroit, has developed a new internal gear checker to check tooth spacing, eccentricity, pitch diameter and root diameter of spur or helical gears from 3 to 64 diametral pitch and from 2 to 18 inches

pitch diameter. With an auxiliary head, the parallelism of spur gear teeth may also be checked.

Principal elements of the machine are rigid base, a work spindle mounted on precision anti-friction bearings, an adjustable counter-weighted column and the checking head carried on the end of an overarm, adjustable axially to and from the work spindle axis to accommodate gears of varying diameter. The

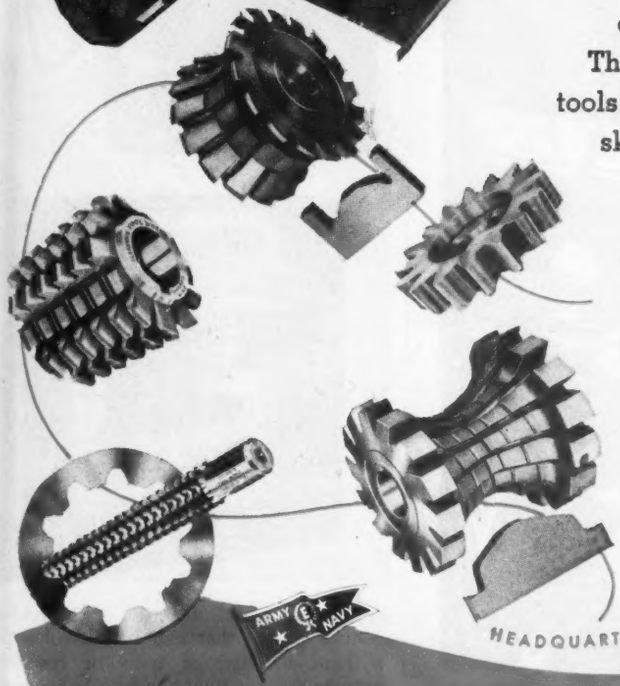
(All claims are those of the manufacturer of the equipment being described.)

YOU CAN *Produce More*

WITH CUTTING TOOLS ENGINEERED BY ILLINOIS

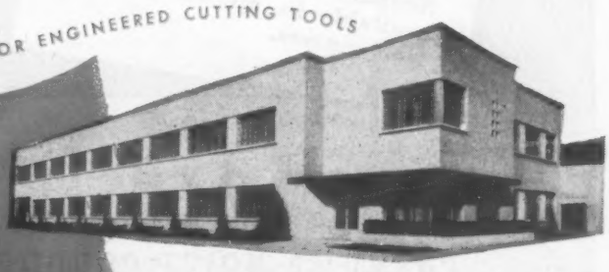
A VAST EXPERIENCE IS READY TO HELP SOLVE YOUR SPECIFIC PROBLEMS

Many metal cutting operations have peculiar conditions which are most efficiently met by tools especially engineered for the specific application. The new metals, new techniques and new machine tools coming into use call for outstanding engineering skill and experience to produce the proper tooling to take full advantage of their production possibilities. The engineers and metallurgists at Illinois Tool draw upon the knowledge gained through thirty-two years of practical experience solving tooling problems of major production industries to give you cutting tools engineered for increased efficiency and longer life.



Overnight to All America... From The Hub of Air Transportation

HEADQUARTERS FOR ENGINEERED CUTTING TOOLS



ILLINOIS TOOL WORKS

2501 N. Keeler Avenue, Chicago 39, Illinois
In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

ONLY YESTERDAY . . .

TODAY AND TOMORROW

PUSH A BUTTON—AND SOLVE EVEN THE TOUGHEST LOADING JOB.

Shepard Niles introduced Selective 5-Speed Push-Button Control in 1932. After rigid tests in our own experimental department and in the field, under actual working conditions, it was put on the market—and has been a resounding success ever since, in all industries. It can be used with floor, cab or pulpit operated electric cranes and hoists.

The Shepard Niles Single-Speed Push-Button Controller is especially useful for small hoists and trolleys operating at slow speed where delicate handling of the load is not required.

Save manpower, operating cost, speed production with the equipment of tomorrow. Shepard Niles engineers are available in all war-production centers.

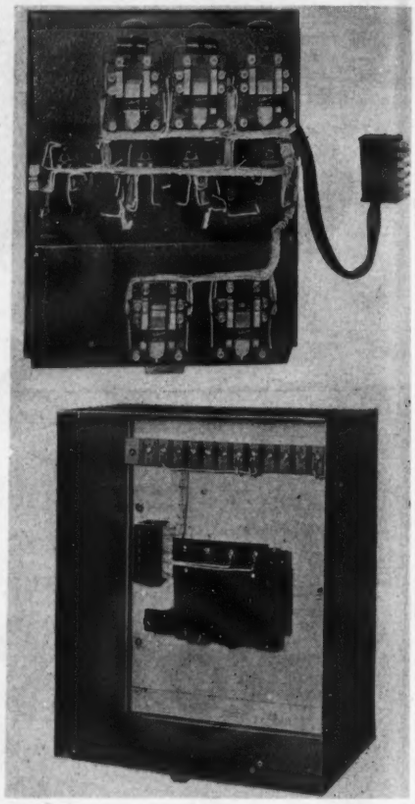
Shepard Niles
CRANE & HOIST CORPORATION

358 SCHUYLER AVENUE • MONTOUR FALLS, N. Y.

checking head spindle at right angles to the work spindle is spring loaded to advance it toward the work gear teeth. Spring pressure is adjustable. The spindle is retracted by a hand lever at the front of the checking head. A ball pointed contact finger and a movable pivot are at the forward end of the head and at the rear end is an arm which contacts the spindle of a 0.0005-inch indication on top of the head to register axial movement of head spindle in measuring eccentricity errors of pitch diameter and root diameter. An adjustable gear tooth locater mounted on the table positions the work gear with reference to the ball point contact finger.

Plug-In Timers

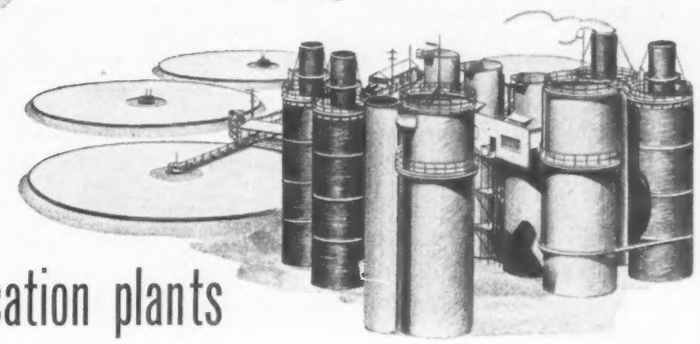
Timers with interchangeable plug-in type control panels making possible the conversion of timing controls to any of the NEMA standard types in a few seconds are announced by Weltronic Co., 19500 West Eight Mile road, Detroit 19. The design of the complete range of new weld and sequence timers incorporating a universal cabinet-and-power-



supply unit and a series of individual control panels that can be interchanged without the use of tools or rewiring, permits any resistance welder to be available for any type of welding within its capacity.

Use of a flexible cable, multi-point plug and receptacle for the interconnection between a control panel and the power supply unit and a slotted-hinge type panel mount reduces the removal of a control panel to a swing-out, pull-plug, lift-off hand operation. Another panel of either the same, or for a different type of welding can also be

When you turn to magnesium —turn to the pioneer producer and leading fabricator



Dow engineers and Dow fabrication plants are backed by 29 years' unmatched experience

When you work with magnesium, take full advantage of Dow's knowledge and experience in handling this lightest of structural metals. It pays, as many manufacturers well know. For Dow is the pioneer, with a background of 29 years' intensive work in producing, alloying and fabricating magnesium.

These years of development and production experience enable Dow to offer an exceptionally diversified magnesium line. But of equal or even greater importance to the manufacturer who buys this output is the wealth of technical, engineering knowledge which Dow likewise offers.

This knowledge is yours to command. When you build a product incorporating the benefits of weight-saving magnesium, feel free to call on Dow's trained staff of magnesium consultants for advice and assistance. Simply contact the nearest Dow office.

DOWMETAL

magnesium

THE METAL OF MOTION

MAGNESIUM DIVISION, THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St Louis • Houston • San Francisco • Los Angeles • Seattle

DIE-CASTINGS SIMPLIFY HOMELITE GENERATOR ASSEMBLIES

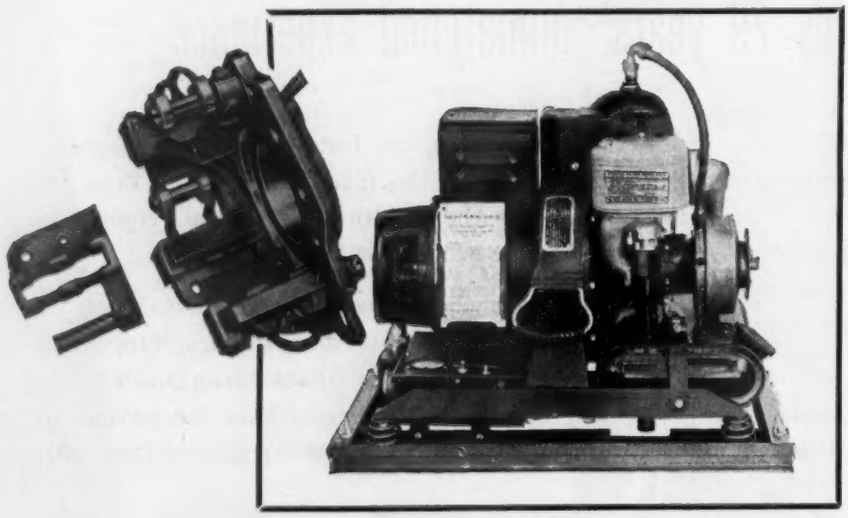
By die-casting brush holders and rings HOMELITE Corporation was able to junk a complicated rivet-and-weld assembly of twelve parts for a stronger, more dependable one of only two parts, in their well-known HOMELITE Portable Generators used in Army Liberators, Flying Forts and other planes.

In addition, by die-casting carburetor cover and fittings more time and money were saved.

Moreover, it was found that the tolerances in every case were close enough to make unnecessary any machining.

Think what this means! With limited available manpower HOMELITE was able actually to turn out a better product faster and at lower cost.

This is no unique experience. Again and again, in all manner of industries, ADVANCE castings have made other forms of fabrication obsolete overnight. You, too, perhaps? Why not consult us? No obligation.



ADVANCE PRESSURE CASTINGS, INC.

ENGINEERS, DESIGNERS AND MANUFACTURERS OF DIE-CASTINGS OF "QUALITY WITH ECONOMY"

42 NORTH 15th STREET, BROOKLYN 22, NEW YORK

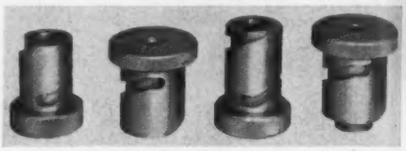
set in. Provision of a spare control panel to replace any one of a group in service permits the inspection of servicing of all welder controls to be performed without shutting down any of the machines.

The power supply unit is adaptable for 115, 230, 575, or 460 volt, 50/60 alternating current service by shifting one jumper. Precision timing, fully electronic and adjustable by dials accurately calibrated in cycles, is provided for wide ranges of welder electrode movement and pressure sequences. Each time adjustment is independent of all others.

Mounted in steel cabinets, the timers are of safe dead front design, protected by a removable tamper-proof cover. Complete, self-contained package units, they can be wall mounted or built into new machines or any standard spot, flash, butt, seam, pulsation or projection welder now in operation.

Self-Locking Bushings

Spiral grooved, self-locking bushings, devised by General Electric's Erie Works, are adaptable to any fixture with members sufficiently large enough to accommodate liner and slip bushings. The bushings provide a positive locking feature which insures an accurate means



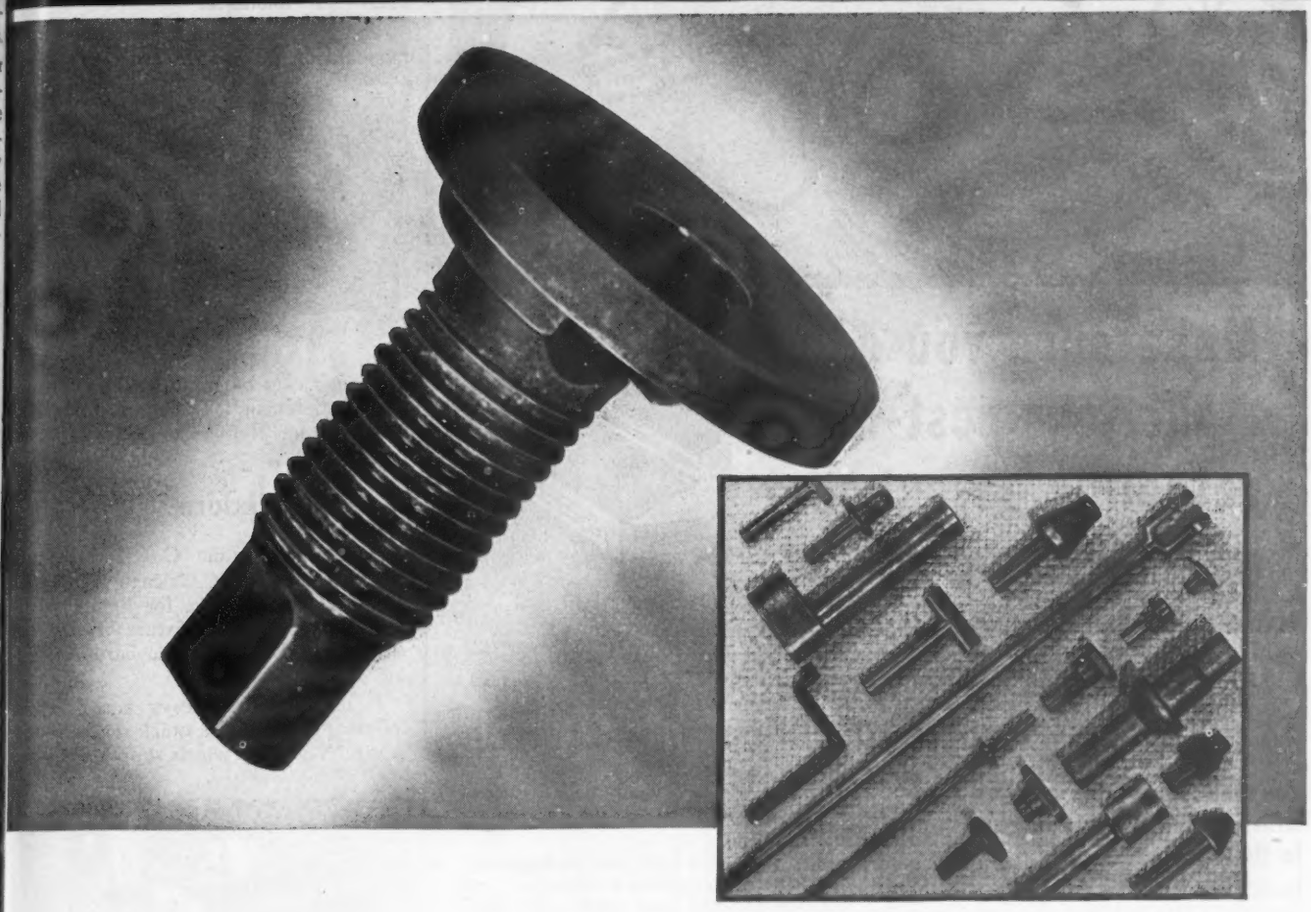
of drilling, reaming and broaching brush-holder locating holes in motor magnet frames to close tolerances. The bushings are of various sizes. They are hardened and precision ground with a spiral groove incorporating a flat at the top which interlocks with a hardened pin inserted in the liner jig. The clockwise rotation of the drill, which holds the bushing in position, prevents it from being forced out of the jig during the drilling operation. The drill is well piloted and will not deflect or run.

Boring and Facing Unit

A horizontal three-way machine for boring five holes and facing four holes in a truck axle mounting, or carrier, is designed and built by LeMaire Tool & Mfg. Co., Dearborn, Mich. It consists of two heavy duty spindle quill assemblies on a main base, with another assembly (slide type) of two spindles at right angles to these mounted on a rear base. All three are actuated by twin ram hydraulic units.

In one cycle two spindles supported by heavy duty quill assemblies approach each other from opposite directions to bore and finish two holes in a large truck axle mounting located in a center fixture. At the same time the rear head moves in at right angles to bore three holes and finish face two holes. The boring of the lower holes is done with the caps

100 YEARS *Making strong the things that make America strong*



COLD-FORGING solves many problems

. . . of strength . . . of accuracy . . . of appearance . . . of cost

There are various reasons why cold-forging was selected as the best or perhaps the *only* efficient method of producing these parts.

Some were cold-forged in order to obtain maximum *strength*. Proper cold-working definitely increases tensile strength and also provides an automatic inspection of the material.

Others were cold-forged because *accuracy* of dimension and fine *appearance* were paramount considerations. That modern cold-upsetting equipment can meet such specifications is evidenced by the billions of fastening parts for aircraft service that have been made by this method.

And in many cases, the *economy* of the method made it attractive. The high speed of RB&W's cold-forging machinery reduces cost below that of other methods which require several or slower operations. With practically no scrap waste, there is also a saving in weight of metal required.

100 YEARS EXPERIENCE

1945 marks RB&W's 100th year in the production of high-quality fastening products. Its experience in automatic cold-forging—the longest of any manufacturer—will be helpful to you in determining the most efficient means of obtaining parts like those shown above. Plan to make use of RB&W facilities when they are again available upon completion of war assignments.

RB&W

Russell, Burdsall & Ward Bolt and Nut Company . . . *Factories at* Port Chester, New York, Coraopolis, Pa., Rock Falls, Ill., . . . *Sales offices at* Philadelphia, Detroit, Chicago, Chattanooga, Los Angeles, Portland, Seattle . . . with the industry's most complete, easiest-to-use catalog.

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Are you tying up too much capital in single-purpose machines?
Are you flexible enough to quickly adapt to changing conditions?
Is your fixed overhead on machine tools too high?

Make sure you don't put your post-war retooling investment into "white elephants"...

Tool up with low-cost, flexible

Delta-Milwaukee Machine Tools

You maintain volume and quality... with big savings—yet stay adaptable to the uncertainties that lie ahead

Delta's conception of tool design provides you with a safe, flexible approach to post-war retooling. It eliminates the necessity for tying up heavy capital in costly, cumbersome, special machines of limited usefulness that are slow to build and that may become obsolete with the next change in product design.

By adopting this modern tooling practice — proven sound in war production, you can build high-production machines to do specific jobs, using low-cost, stock model Delta elements which are readily convertible when requirements change.

You can salvage your present machines which are approaching obsolescence, by replacing worn units with standard Delta components.

And, by taking advantage of the portability and compactness of Delta machines, you can quickly revise production line layouts to get increased man-hour output.

Low-cost Delta units and the ingenuity of your engineers form a workable combination to solve your production problems. Delta's savings in cost, weight, and space are not made at the expense of quality, but are due to advanced design and modern production methods applied to a large volume of standard models.

Cut your investment risk in post-war retooling. Save money . . . stay adaptable — with Delta-Milwaukee Machine Tools, in units, batteries, and special set-ups.

MA-18

Delta's 76-page Blue Book

provides 140 case histories of valuable war production experience that may suggest similar money-saving peacetime applications in your plant. Also available is a catalog of low-cost Delta-Milwaukee Machine Tools. Request both, using coupon below.

Tear out coupon and mail today!

THE DELTA MANUFACTURING CO.
702C E. Vienna Ave., Milwaukee 1, Wisconsin

Please send my free copies of Delta's 76-page Blue Book and catalog of low-cost machine tools.

Name.....

Position.....

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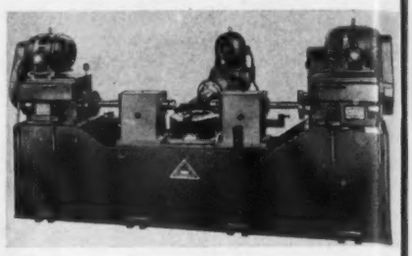
An example of the flexibility and wide application of standard Delta parts is this special Delta Drill Press set-up, for extremely accurate slicing of thin wafers of quartz crystals used in communications instruments. A Delta 14" drill press head — to which an abrasive wheel is attached — is pivot-mounted on its side and power fed by a hydraulic cylinder. A Delta compound slide rest on the base of the drill press allows the entire table to be moved in two directions so that the crystal can be placed to get the proper cut.

in place to assure the perfect shape of the holes. A second operation is required for finish boring all holes to 0.001-inch tolerance.

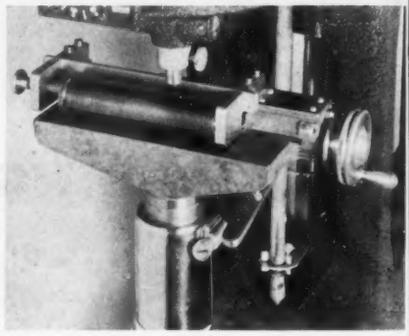
The spindle quill assemblies are mounted on precision bearings for guiding the boring bars and maintaining accurate alignment. The units rotate and feed the tools through the flexible joints.



Indexing Fixture

Precision Scientific Co., 1750 North Springfield avenue, Chicago 47, offers a new indexing fixture for Jominy hardenability bars. This fixture mounts on either the Clark or Wilson hardness testing machine.

It consists of a heavy base casting, indexing screw and a quick return mechanism. The plug which supports the fixture in the hardness tester is hardened and ground tool steel, projects upwards through the base casting and forms the surface against which the diamond point presses against the Jominy bar. The screw operating the carriage back and forth is stainless steel and turned by a brass chrome-plated hand wheel. The bronze half-nut is fastened to a quick release lever engaging the screw. When the test bar has reached the end of its travel, the half-nut is released and the entire carriage slides back to the new starting position. An adjustable stop automatically provides the initial starting point on the test bar. A spring plunger holds the bar into position and allows enough freedom for it to rest firmly on the hardened steel stud.



Resistance Welders

Two additions to the new storage-battery powered line of resistance welders are announced by Progressive Welder Co., 3050 East Outer drive, Detroit 12.

IF YOUR PRODUCT CALLS FOR ELECTRIC WELDED STEEL TUBING ★★★★★

GET IN TOUCH WITH US

Whatever your problem in ELECTRIC WELDED STEEL TUBING... mechanical, structural or pressure application... it will pay you to investigate our facilities. We are equipped to furnish this material in the diameters and gauges shown in the table at the right, and in many intermediate sizes. Highest quality workmanship. Prompt attention to every inquiry—large or small. Let us help you. For further information, contact our representative in your area, or write us direct.

SIZE AND THICKNESS CHART

★ ★ ★ ★ ★

TUBE DIAMETER	MAXIMUM WALL		MINIMUM WALL	
*O.D. SIZE	DECIMAL	GAUGE	DECIMAL	B.W. GAUGE
1/4"	.065"	16	.028"	22
3/8"	.065"	16	.028"	22
1/2"	.065"	16	.028"	22
5/8"	.065"	16	.028"	22
3/4"	.065"	16	.028"	22
7/8"	.065"	16	.028"	22
1"	.095"	13	.028"	22
1-1/8"	.083"	14	.028"	22
1-1/4"	.095"	13	.028"	22
1-3/8"	.095"	13	.035"	20
1-1/2"	.109"	12	.035"	20
1-5/8"	.120"	11	.035"	20
1-3/4"	.120"	11	.035"	20
1-7/8"	.120"	11	.035"	20
2"	.165"	8	.035"	20
2-1/4"	.180"	7	.035"	20
2-1/2"	.203"	6	.035"	20
2-3/4"	.203"	6	.049"	18
3"	.220"	5	.049"	18
3-1/4"	.220"	5	.065"	16
3-1/2"	.238"	4	.065"	16
3-3/4"	.238"	4	.065"	16
4"	.250"	3	.065"	16
4-1/4"	.250"	3	.083"	14
4-1/2"	.250"	3	.083"	14
5-1/2"	.134"	10	.083"	14

*Intermediate sizes within the range indicated can also be manufactured. Please consult us for sizes not listed.

THE STANDARD TUBE CO.

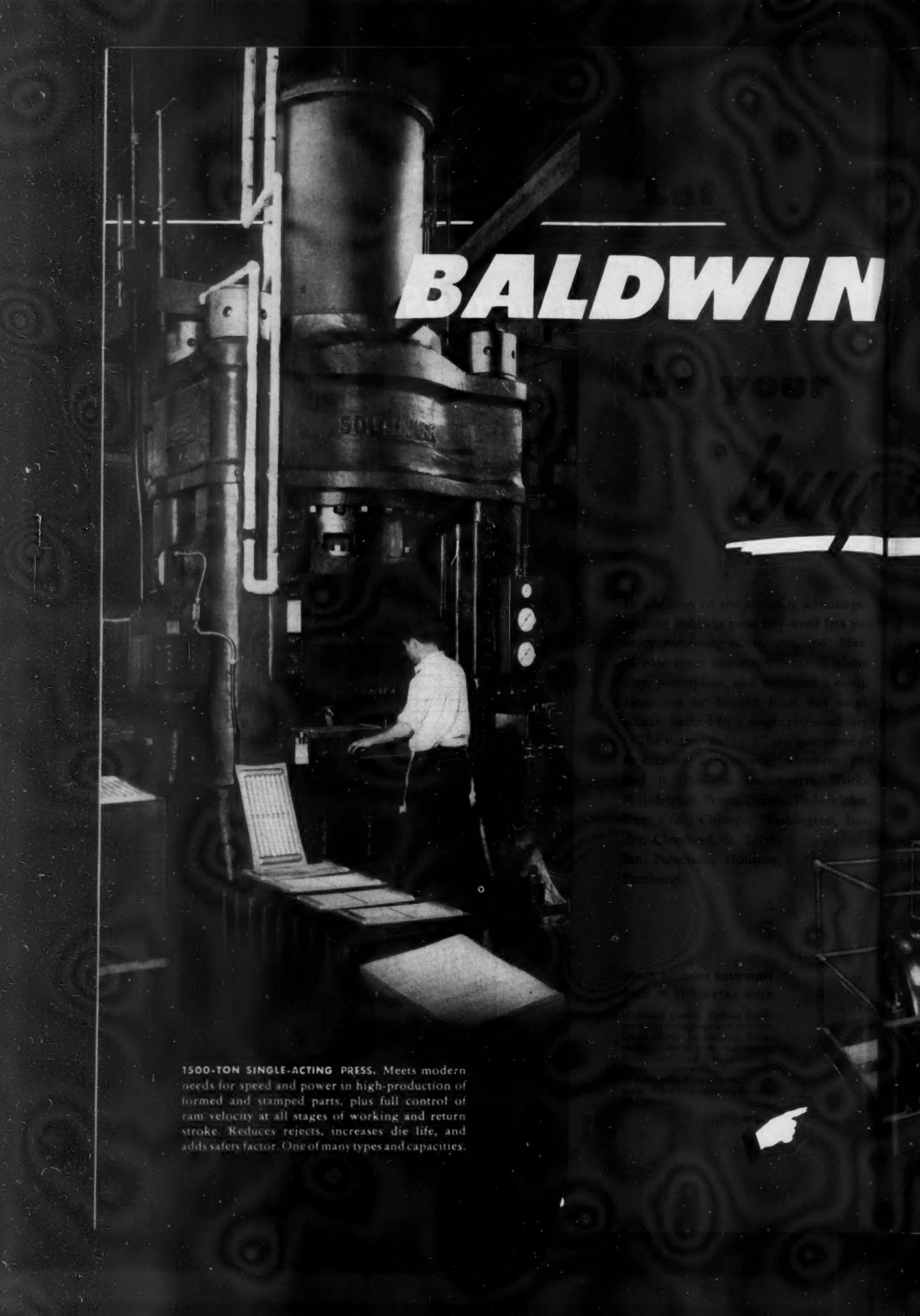
Detroit 3, Michigan

STANDARD

Welded Tubing Steel Forgings

★ *Complete Tube Stocks Maintained by* ★

STANDARD TUBE SALES CORP., One Admiral Ave., Maspeth, L. I., N.Y.
LAPHAM-HICKEY COMPANY, 3333 W. 47th Place, Chicago 32, Ill.
UNION HARDWARE & METAL CO., 411 E. First St., Los Angeles 54, Cal.



1500-TON SINGLE-ACTING PRESS. Meets modern needs for speed and power in high-production of formed and stamped parts, plus full control of ram velocity at all stages of working and return stroke. Reduces rejects, increases die life, and adds safety factor. One of many types and capacities.

SR-4 STRA
strains to
as small
shown is
SR-4 PORTABLE STRAIN INDICATOR. Sturdy, portable, self-contained. For laboratory or production testing.
RE
INST
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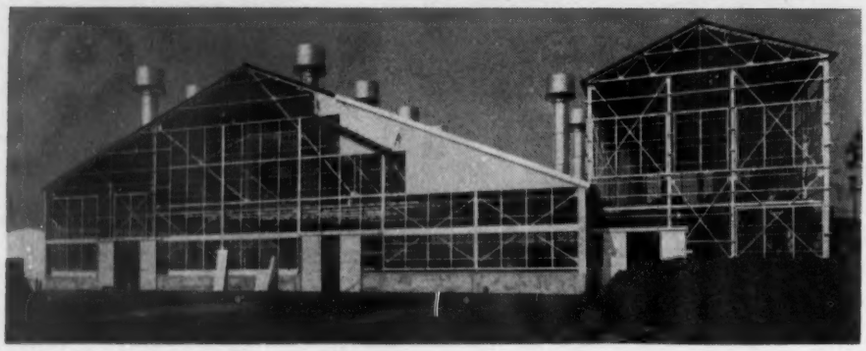
tinuous
perman
SR-4
compa
torque
BLW
THE BALDWIN GROUP
The Baldwin Locomotive Works, Philadelphia, Pennsylvania: Locomotive & Ordnance Division; Baldwin Southwark Division; Cramp Brass & Iron Foundries Division; Standard Steel Works Division. The Whitcomb Locomotive Co.; The Peterson Water Wheel Co.; The Midvale Co.

Added Advantage

FOR FABRICATED STEEL CUSTOMERS



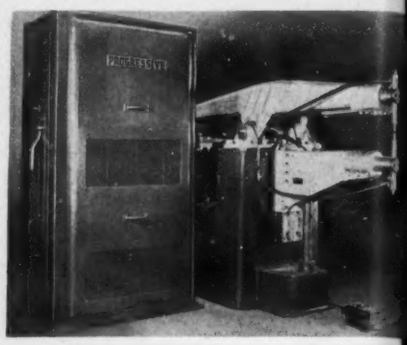
INGALLS' active working interest in many branches of the steel industry gives this company first-hand practical knowledge of the problems facing users of fabricated steel. Our continuous search for improved methods in the manufacture of tanks, barges, workboats and other "production line" items, in building ships and in actual field erection work, often leads to developments advantageous to fabricated steel customers. Improved methods of construction, fabrication or design, discovered in solving a shipbuilding headache, may be applied to your problems in building a bridge or a skyscraper. Look to Ingalls for the latest developments and economies in utilizing welding in the production and use of fabricated steel.

THE INGALLS IRON WORKS COMPANY, THE INGALLS SHIPBUILDING CORPORATION, The Steel Construction Company, Birmingham Tank Company. Offices at BIRMINGHAM, New York, Washington, Pittsburgh, New Orleans. Fabricating plants at Birmingham and Pittsburgh. Shipyards at Pascagoula, Miss. and Decatur, Ala.

INGALLS STEEL

One is a spot welder of the rocker arm type, self-contained with storage batteries, contactor-controller and infinitely variable heat-control regulator all enclosed in the base of the machine. Operation of the machine is from normal factory air line pressure. The electrical system consists of six three cell "welding" batteries designed to withstand high discharge rates. Both upper and lower arms are adjustable. Rated capacity of the machine is two pieces of 14 gage mild steel or two thicknesses of 0.040-inch aluminum. Control for the stepless sliding-contact type heat regulator is on the side of the base.

The second machine is a heavy duty type and designed so that both spot

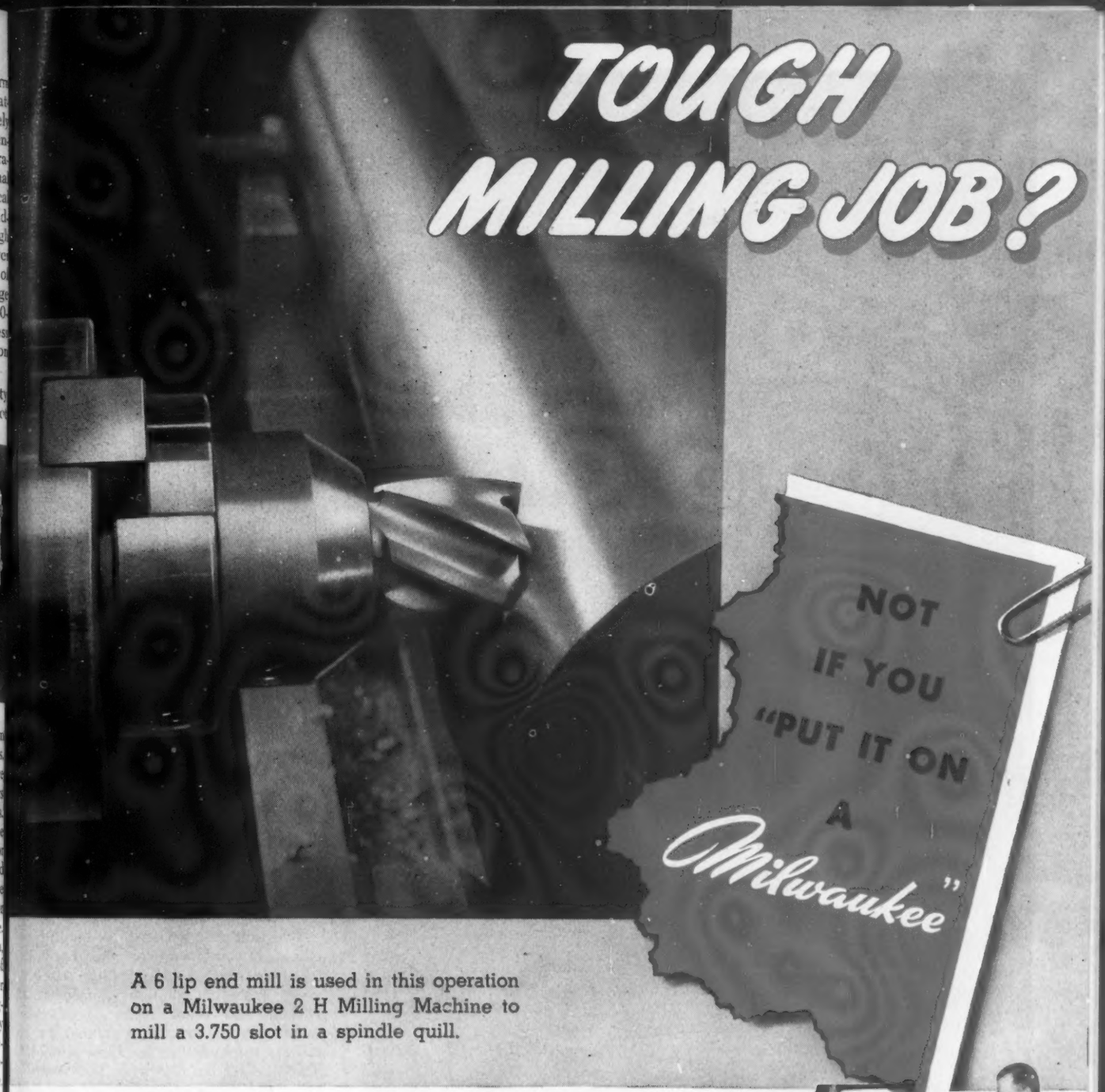


and roll-welding can be performed on the same machine with minor changes. Batteries for this type of machine are housed with contactors, battery charger and controllers in standardized units. General construction of this machine follows that of rocker-arm welders. For roll-spot welding, the rolls are mounted on the ends of the arms, where they are driven through gears from a motor mounted in the base of the machine. Both upper and lower rolls are driven, permitting the welding of sections of aluminum at speeds up to 50 inches per minute. The rolls are internally refrigerated. Wheels are designed so they can be reconditioned when worn by removing a ring from the outside diameter and replacing it with a new one. Maximum welding current which this welder can handle when supplied with dual power packs is 50,000 amperes. Each power pack contains 16 cells of storage batteries, 25,000 ampere mechanical nonarcing contactor-controller and a battery charger.

Coolant Separator

The magnetic-automatic coolant separator introduced by Barnes Drill Co., Rockford, Ill., embodies a method for automatically removing harmful metal and abrasive particles from honing coolants having a nonsoluble base. All swarf and magnetic particles are automatically removed through magnetic attraction. The separator is a self-contained, motor driven unit, employing a magnetic rotary drum, which attracts metallic particles as they pass through the coolant and carries them out as the drum rotates. The drum is constructed of a series of permanent magnets mounted all the way around

TOUGH MILLING JOB?

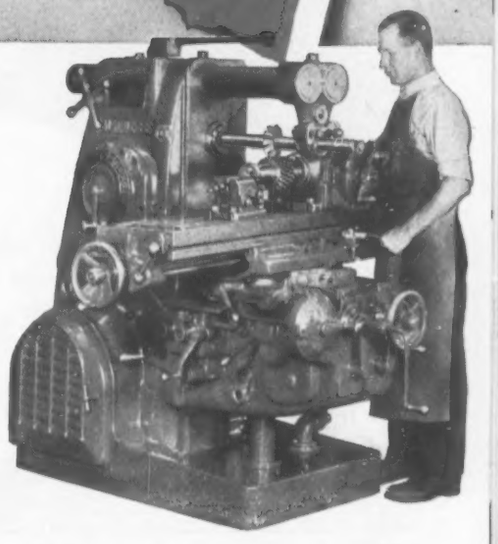


A 6 lip end mill is used in this operation on a Milwaukee 2 H Milling Machine to mill a 3.750 slot in a spindle quill.

The range—power—precision of Milwaukee Milling Machines —their exceptional ability to handle a wide variety of intricate, difficult milling operations at the most effective speeds and feeds — has made them the first choice of experienced purchasers.

"Put it on a Milwaukee" and you know the job will be done *right* — and with the least time and trouble.

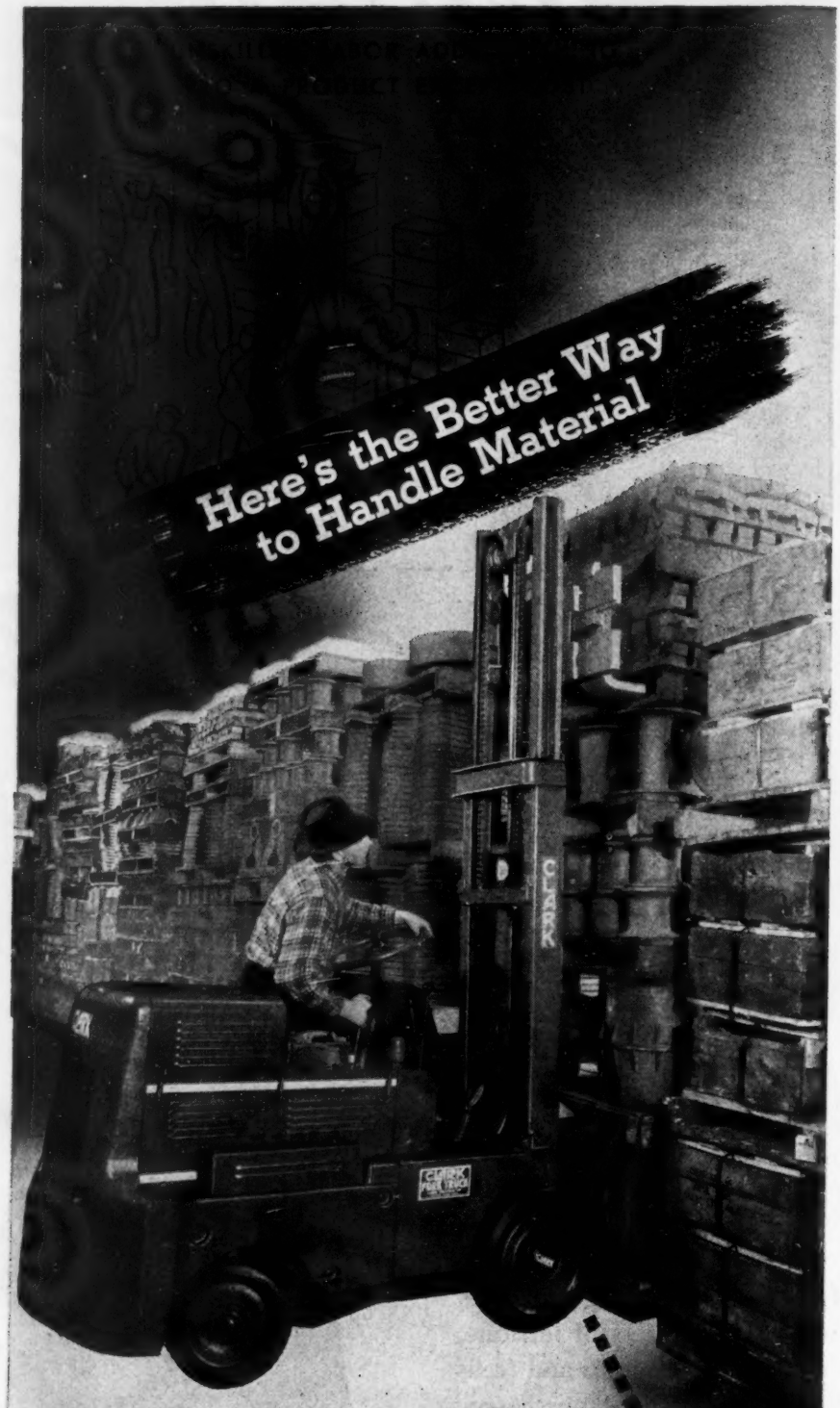
Year after year you can be sure of sustained precision performance because every Milwaukee Milling Machine—is engineered and built in proper relation to its motor power — powerated!



Milwaukee Machine Tools

KEARNEY & TRECKER CORPORATION

MILWAUKEE 14, WISCONSIN



Clark industrial haulage vehicles are used the world over to handle materials because they—

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- save time
- operate cheaply
- release manpower for productive work

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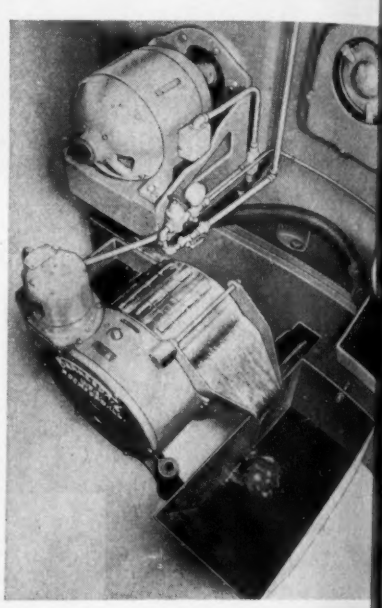
Products of CLARK • TRANSMISSIONS • ELECTRIC STEEL CASTINGS AXLES FOR TRUCKS AND BUSES • AXLE HOUSINGS • BLIND RIVETS INDUSTRIAL TRUCKS AND TRACTORS • HIGH-SPEED DRILLS AND REAMERS METAL SPOKE WHEELS • GEARS AND FORGINGS • RAILWAY TRUCKS

the inside and rotating with it. Th coolant flows in a thin wide chann through the lower part of the separat in a counter direction to the slow rot tion of the drum; the metal and abrasiv particles form on the drum and exten on end in a definite brush-like patter As the drum rotates, the sludge mass scraped off and discharged through chute into a movable pan.

Where gravity feed of the coolant fro the machine to the separator is impra ticable, a motor driven pump may b used for transferring the used coola

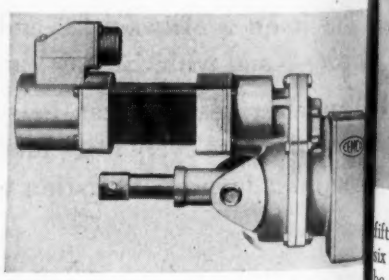


into the separator. After the coolant cleansed it is carried by gravitation fro the separator into the cleaned coola reservoir.

The unit can be used on honing m chines of both vertical and horizont types as well as on grinding machin when a soluble solution is used as t coolant and other types of machin where minute particles of magnetic ma rial are suspended in the flow of coola Two sizes of the separator, both emplo ing a ¼-horsepower motor are availab

Motor Actuating Unit

Designed for unusual installation a operational conditions, an electric mo driven linear actuating unit is announc by Electrical Engineering & Mfg. Cor



4606 West Jefferson boulevard, Los A geles. Engineered to extend "d brakes" on Lockheed P-38 Fighters, unit is av actuating units guarantee uniform ope tion in the space of seconds, meet p

cise weight and size specifications and fit the wing panels of present P-38's as well as earlier models that are now in combat.

The principal technical features of this 10,000 revolutions per minute, 1¼ horsepower, self-contained actuating device include a double integral gear reduction unit to operate the screw jack actuator, magnetic clutch and brake, a control gear reduction drive to turn cams for opening and closing specially developed limit travel switches. Maximum load is 3000 pounds, with 2½ inch travel on the jack in less than 2 seconds. An additional take-off shaft is provided for positioning indicator.

Vertical Type Pump

Designed to handle liquids containing abrasive materials, a new recirculating vertical type pump is offered by Claude B. Schneible Co., 2827 Twenty-

fifth street, Detroit 16. By removal of six bolts at the base, the housing can be removed. It is of a wear resisting alloy iron. The pump can also be used for coolants on machine tools, etc. The unit is available in 3/8, ½, 3/4, and 1¼-inch sizes with a capacity of 2 to 35 gallons per minute.

We're Saving DIAMONDS Here!
Diamond consuming rough grinding is eliminated by precise adjustment of insert in TUNGTIP carbide milling cutters. Only finish grinding is necessary. TUNGTIP blades are accurately positioned by screw mechanism.

DETROIT, MICHIGAN
P.O. BOX 1027

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MONROVIA, CALIFORNIA
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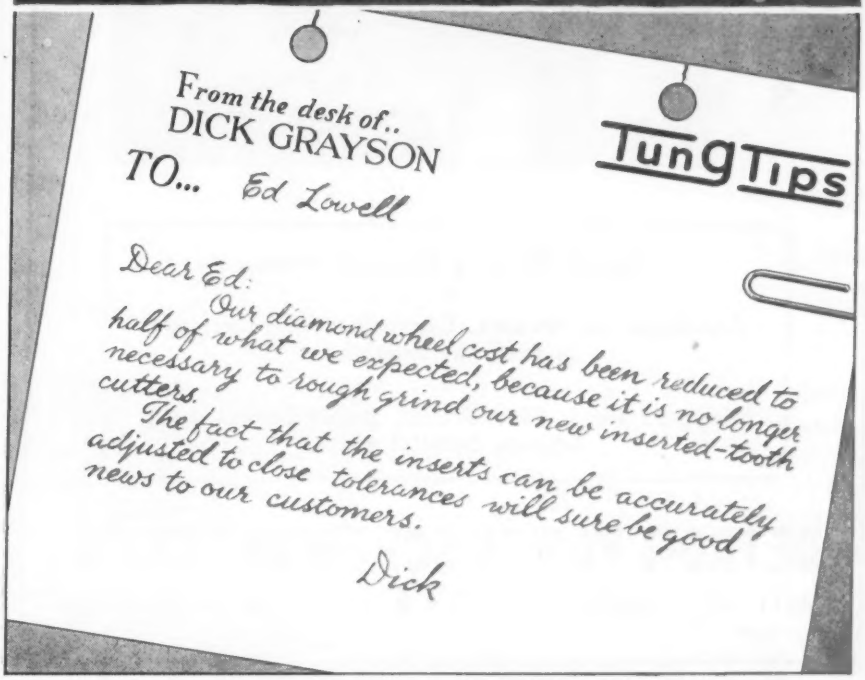
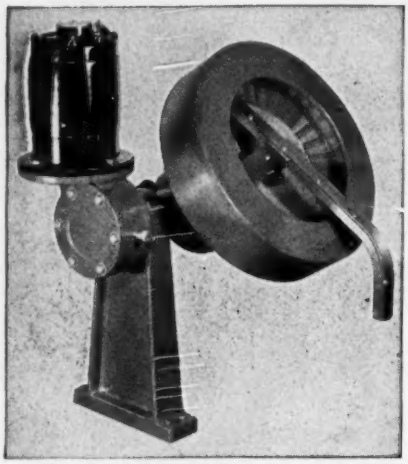
LOWELL & GRAYSON ... formerly Grayson Manufacturing Co.


From the desk of..
DICK GRAYSON
TO... Ed Lowell
TungTips
Dear Ed:
Our diamond wheel cost has been reduced to half of what we expected, because it is no longer necessary to rough grind our new inserted-tooth cutters.
The fact that the inserts can be accurately adjusted to close tolerances will sure be good news to our customers.
Dick

PRODUCTION EQUIPMENT

HOPPERS



Drive Screws with Hopper Feed Power Screwdrivers.

Place the assemblies in position, the machine does the rest.

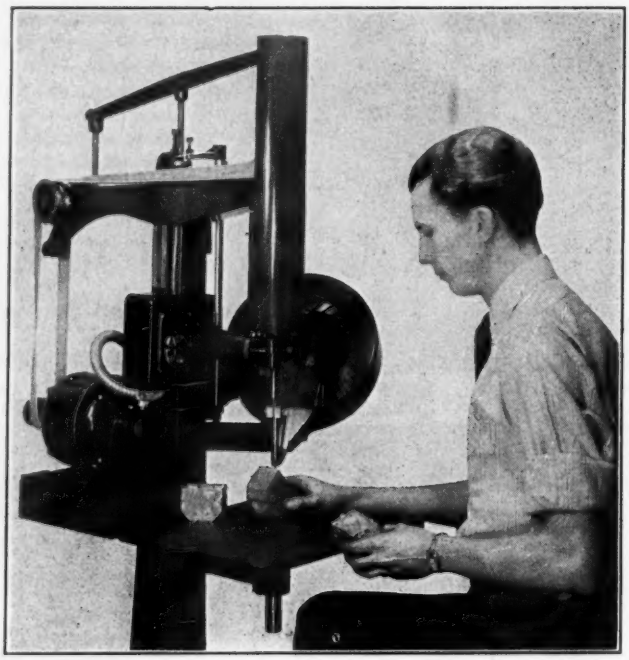
Screws are all driven to a uniform tension.

No marring of screw heads.

Three models to take care of all sizes from No. 2 to ⅝ dia.

Send samples for production estimates.

SCREWDRIVERS



Fastest Feeding Hoppers made.

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Adaptable to Presses, Centerless Grinders, and in fact any machine.

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Hoppers Feed: Pins, Rivets, Bullet Cores, Nuts, Screws, Special parts.

DETROIT POWER SCREWDRIVER CO.

2811 WEST FORT STREET • DETROIT 16, MICHIGAN

Polaragraphy

(*Continued from Page* 123)

As little as 0.1-per cent lead, which greatly affects machinability of steel, can be determined easily and accurately.

Since polarography works on concentration, not total quantities, Dr. Prendergast points out it is excellent for micro-analysis where only very small amounts of material are available for analysis. This contrasts with wet methods (conventional chemical methods) where it is usually necessary to use fairly large samples of 100 grams or more and to make repeated time-consuming separations.

Polarography, where applicable, is reported considerably cheaper and often more rapid than spectrochemical determination. It is not suitable, however, for determining sulphur, phosphorus, carbon or silicon. Other limitations are detailed further along after the description of the equipment and explanation of its operation, information necessary to appreciate these limitations.

While the method is primarily employed for its value in determining exact quantities of minute traces, it also is excellent for qualitative work.

Die Casting: One of the most important fields at present is in the checking and control of high-purity zinc alloys used in die casting. Here polarography provides quick precise determination of amounts of lead, cadmium and copper down to traces as small as 4/10,000-ths of 1 per cent. These elements as well as tin tend to cause intergranular corrosion which results in serious weakening of the alloy, even when mere traces are present. It is not unusual to find specifications for such alloys requiring that lead not exceed 0.003-per cent, cadmium 0.003-per cent, tin 0.001-per cent.

At present it is hard to get a clear indication of tin on a polarographic curve, but Dr. Prendergast reports that a satisfactory procedure may shortly be perfected.

Electroplating: Polarographic checks of plating solutions are easily handled because the elements are already in solution and so need little preliminary work to prepare them for testing. Here the method affords a degree of sensitivity and precision that has been almost impossible to obtain previously in a simple, fast analytical procedure.

Dr. Prendergast relates how one plant had difficulty with copper building up in a zinc plating bath. Zinc dust was being added regularly in an attempt to lower the copper content. Polarographic check, however, showed that instead of decreasing, the zinc dust was actually increasing the copper content of the bath. From that point on, it was not difficult to devise a remedy for the trouble.

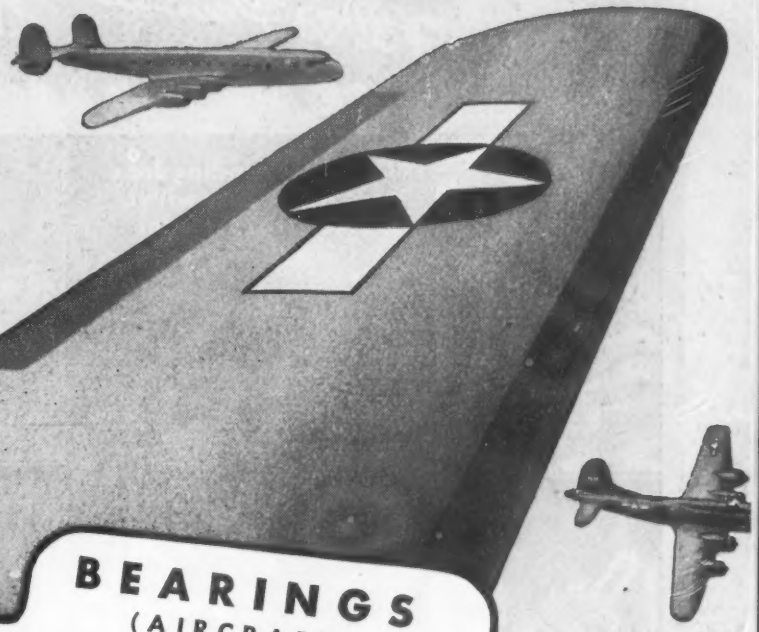
Lead Poisoning: Polarography also offers important advantages in biological work, because of its extreme simplicity and great speed. For example, employes exposed to lead poisoning should be checked at regular intervals to de-

THE FIGHTERS OF TODAY AND THE FLAGSHIPS OF TOMORROW

nother tough cleaning problem lved by "THE PENN SALT MAN!"

HE aircraft industry has offered some of the toughest metal cleaning and plating blems in war production plants. It has been privilege to be helpful through our prod- and our men in the solution of many such blems. Both the men and the products of n Salt's Special Chemicals Division are pre- ed not only for these war-time services but equally well prepared for reconversion and problems of the future.

e is an actual case of a leading aircraft ine manufacturer, drawn from our files:



BEARINGS
(AIRCRAFT)

PRODUCTS USED: PENNSALT CLEANERS EC-10, No. 37, and K-7 BEFORE LEAD PLATING WITH PENNSALT LF-42

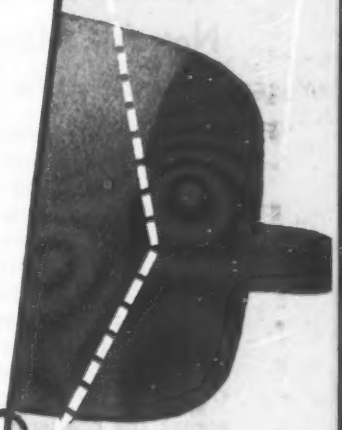
PROBLEM: To remove slushing oil from copper-lead alloy and silver plated steel bearings prior to lead plating.

EQUIPMENT: Plating done in individual pyrex glass plating tanks, large enough to accommodate one bearing. Conventional soak and electrolytic cleaning tanks.

OUR METHOD:

1. Preclean with Pennsalt EC-10 (solvent dip) followed by spray water rinse.
2. Soak clean in Pennsalt #37, 6 oz/gal., 5 to 10 minutes, 190 to 200° F.
3. Hot water rinse.
4. Electroclean in Pennsalt K-7, 8 oz/gal., 190° F., 15 to 30 seconds—work made the cathode.
5. Hot water rinse.
6. Lead plating solution made up of one part Pennsalt LF-42 to two and one-half parts water —with glue addition. Used at room temperature, 15 amps./sq. ft., for 28 minutes, which plates .001" thickness.
7. Cold water rinse.
8. Cyanide dip.
9. Indium plate.

COMMENTS: This cycle employs four Pennsalt Products.



"THE PENN SALT MAN" FIRST A TECHNICIAN ... THEN A SALESMAN

Penn Salt Special Chemicals Division men are well trained in the application of chemicals to industry's problems. If you have a metal cleaning problem, don't hesitate to seek the advice of "THE PENN SALT MAN." He will advise you without obligation.

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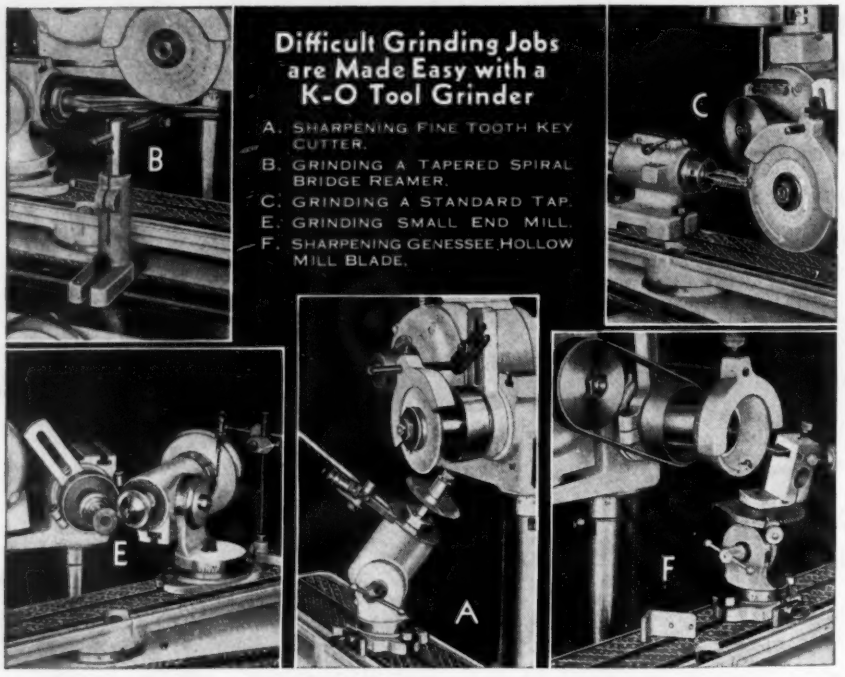
Cutting Tools Must Be Conditioned for Post War Production Too!



Difficult Grinding Jobs are Made Easy with a K-O Tool Grinder

A. SHARPENING FINE TOOTH KEY CUTTER.
B. GRINDING A TAPERED SPIRAL BRIDGE REAMER.
C. GRINDING A STANDARD TAP.
E. GRINDING SMALL END MILL.
F. SHARPENING GENESSEE HOLLOW MILL BLADE.

Not All Men and Machines Can Be Released When the War Ends... Some Must Stay on the Job!

When the war broke out, *Knock-Out* Tool Grinders were ready! They've been doing a Titan's job on production work and on tool maintenance throughout the nation and all allied countries. Now as the peace approaches, and thinking men are readying their plants for the tremendous production job which lies ahead, *Knock-Out* Grinders are again ready to accept the challenge!

***Knock-Out* engineers have continually stayed on the alert giving users of K-O Tool Grinders many advantages, making difficult grinding jobs easy.**

•Single Speed or Multi Speed Wheel Heads are available. Wheels ranging from 1 to 10 inches can be used. Tools from the smallest to 12 inches in diameter can be ground with speed and accuracy.

When writing for literature ask for Unit No. 37-35.

K.O. LEE CO.
ABERDEEN, SO. DAK.

termine the amount of lead they ha absorbed. This is done by checking t amount of lead in urine from the su ject.

Whereas conventional chemical a alysis requires 24 hours to process single sample, one operator can check or more samples in a day by use of t polarograph. This great speed low the cost of checking to the point wh it becomes practicable to test all pla employes at regular frequent intervals.

Significance of this is that the pola graph will detect an increase in le pickup before the subject becomes clinical case. This makes it possible switch the employe to other work a so prevents him from developing le poisoning, thereby avoiding compens tion claims and keeping down the pla insurance rate.

Normal lead level in an individ produces a step on the curve that is millimeters high. Persons exposed lead poisoning usually show a 10 to millimeter step. At 40 millimete clinical lead poisoning symptoms devel An operator soon becomes able to p out the limit where a man is a bord line case and should be transferred other work.

Lubricating Oils: The polarograph doing valuable work in checking lub cating oils for it will readily meas the amount of metal picked up by oil through bearing wear. It will a provide an excellent check on amo of "loading" of the oil and thus can used to predict and control gum fo ing conditions.

Catalysts: It is well suited to c trol of catalysts for it easily measu extremely small amounts of active m terial in a large mass.

Impurities: One of the most valua fields is in checking for impurities commercial chemicals and determin accurately the trace amounts that m be present. Applications already m include rapid determination of traces lead in citric acid; bromate and iod in chlorate salts; copper and nickel cobalt and manganese salts; scandi in aluminum; and many others.

Organic Chemistry: Polarography so gives promise of becoming an tremely valuable analytical tool in ganic chemistry and such related fi as biochemistry and biology.

Now that we have some idea of significance and usefulness of this m od of analysis, let's take a look at equipment and procedure employed, the very simplicity of the method is of its most important features.

Setup Is Simple: Fig. 1 is a schem diagram of a typical polarograph ranged for producing voltage-cur curves automatically. The drop electrode feeding mercury drops into cell consists of a drawn out capi tube with internal tip diameter of a 0.03-millimeter, producing a drop mercury every 2 to 4 seconds. Mer drops are quite small, being about millimeter in diameter when they b

off from the tip. A stationary pool of mercury at bottom of the cell serves as the second electrode.

The cell is connected in series with a sensitive mirror galvanometer set up to record directly on a light-sensitive paper chart. After a test has been run, the chart is removed from the instrument in a light-tight cell and developed and fixed under a ruby light in a photographic darkroom.

The voltage applied to the cell is varied from zero to a maximum of 2.5-3 volts by means of a sliding contact which is moved along the resistor wire as the drive motor turns the resistor drum.

As the voltage is applied to the cell, the resulting current is recorded on the revolving chart which is geared to the resistor drum. Since the relation between any position of the chart and the voltage applied to the cell is known, the chart can be pre-calibrated so that it produces a curve showing directly the relation between voltage applied to the cell and resulting current.

Fig. 3 shows the Heyrovsky Polarograph which incorporates all elements of the system described in a single compact piece of equipment. The dropping mercury cell is, of course a separate piece of apparatus set up on the bench alongside the polarograph.

How It Works: Let's follow a simple test through to see what occurs. Suppose we have the material in solution. It is placed in the cell and the dropping mercury electrode started. Then the motor driving the resistor drum is put into operation.

This applies a voltage beginning at zero and gradually building up to maximum desired, something under 4½ volts. Resulting currents are recorded on the calibrated galvanometer chart, usually running to only a few microamperes. A 1-micro-ampere galvanometer with shunts usually handles the full range of currents obtained.

Fig. 2 reproduced from an actual polarogram (name for chart record produced by the polarograph) shows that at first only a barely perceptible current flows through the cell. This is known as the "residual current," or "cathode capacitance" current. It rises slightly in rough proportion to applied voltage and represents principally the current necessary to maintain the cathodic charge on the dropping electrode. When the applied voltage attains a certain value, certain ions from the material in the solution are attracted to the dropping mercury cathode where they deposit their electrical charge, causing the current-voltage curve to show a sharp rise.

As increased voltage is applied, the speed at which ions are attracted to the dropping mercury cathode increases to a rate greater than the solution can supply them. This produces a leveling- or "knee" in the curve that represents the limiting current obtainable from the material represented by those ions.

How Elements Are Identified: The

CURTIS AIR CYLINDERS
Engineered to Your Problem
Save Time — Save Labor

The unique car-dumping mechanism illustrated above is operated by a Curtis Air Cylinder which raises and lowers the car body. It saves time in dumping, is easily operated by one man, and speeds up material handling for Universal-Atlas Cement Company, Hudson, N. Y.

Engineered to the individual problem in a variety of applications, whether a handling, lifting, pushing, or pulling operation, Curtis Air Cylinders are stepping up production and cutting costs in hundreds of industries today.

Installation cost is low and power consumption small, using regular shop or plant air lines. Under continuous service and heavy-duty conditions, Curtis Air Cylinders are giving unfailing service—the result of rugged construction and simplicity of design—only one moving part.

Exceptional accuracy of control—no risk of injury due to overloading or bad atmospheric conditions. Because of their efficiency, low maintenance costs, and long, trouble-free life, important savings in costs and in man-hours are almost inevitable wherever Curtis Air Cylinders or Air Hoists can be used.

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TURNER PLAST-O-LOCK

(Patent Applied For)

GAUGE SAYS STOP

on its NOT GO member!

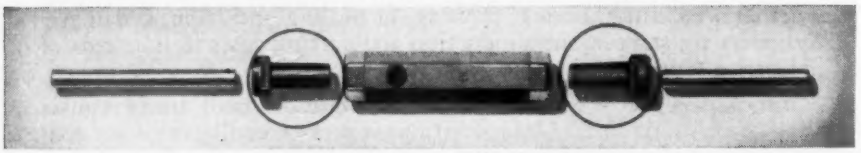
Here's another first by Turner—a *red* plastic collet to more quickly identify the "not go" member of your plug gauges! Plast-O-Lock gauges are great time savers wherever they are used.

Turner's Plast-O-Lock (patent applied for) collet type plug gauges are not only easier to use but they will multiply the life of plug gauges many times. The reason for this is obvious. Because Plast-O-Lock features a collet of plastic, slotted and tapered to fit into the tapered end of a standard plastic handle, it is possible for the gauges to be held securely without their surfaces being scratched or burred, thereby allowing use of most of the gauge's length. For example, as the "go" and "not go" ends are worn beyond allowed tolerances they are simply cut off, thus leaving an unused end ready for gauging. To illustrate further, if a boring no deeper than 1/8" is being checked, as many as 8 fresh gauging sections may be obtained from one standard length "go" gauge as furnished with Turner's Plast-O-Lock. This obviously eliminates the necessity of salvaging used gauges.

For full particulars about Plast-O-Lock gauges wire or write us today.

★ Features ★

1. Multiplies the life of the plug gage.
2. Collet will not mar a lapped or polished surface.
3. Used with plastic handle the gauge has a more sensitive feel in the hands of an inspector.
4. Is easy to make length adjustment because slot is provided for end wrench.
5. Plast-O-Lock size range from .050 to .690.
6. Red plastic collet for quick identification of "not go" members.



DELIVERY Fast delivery can be made on these Plast-O-Lock gauges as well as the following Turner gauges: ring, flush pin, snap and built up.

TURNER BROTHERS

TURNER GAUGE GRINDING COMPANY

2625 HILTON ROAD • • • • FERNDALE, MICH.

Sizes AVAILABLE

Plug Size Range	Length of "Go" Gauge	Length of "No Go" Gauge
.050 to .099	1 7/8	1 3/8
.100 to .149	2	1 1/2
.150 to .199	2 1/4	1 3/4
.200 to .249	2 1/2	2
.250 to .499	3	2
.500 to .690	3 1/2	2 1/2

HOW TO ORDER PLAST-O-LOCK

1. Diameter.
2. Length of gauging surfaces.
3. Tolerance or accuracy.
4. Hardened alloy steel or chrome, tungsten carbide or Nor-Bide.
5. Number of members—Go, Not Go, Handles.
6. Complete marking instructions.

thing that permits the various constituents in the sample to be identified is the fact that the ions from different elements discharge at different voltages, therefore at different points along the voltage axis of the polarogram. Fig. 5 shows typical polarograms with copper, lead and cadmium "steps," each step representing the upward jump in the curve occasioned by discharge of the ions of that material.

As long as the discharge voltages of the various elements in a sample do not come so close together as to cause one step to overlap another, the elements can be identified easily and positively. However, this condition is one of those limitations that must be recognized in using the polarograph.

The shape of the step and exact points of beginning and end of a step depend upon concentration or amount of the element in the sample. However, the mid-point on the step where it ceases to become steeper and begins to level off is completely independent of the amount present. The voltage at this mid-point, called the half-wave potential, is a characteristic constant for each element and so serves as positive identification.

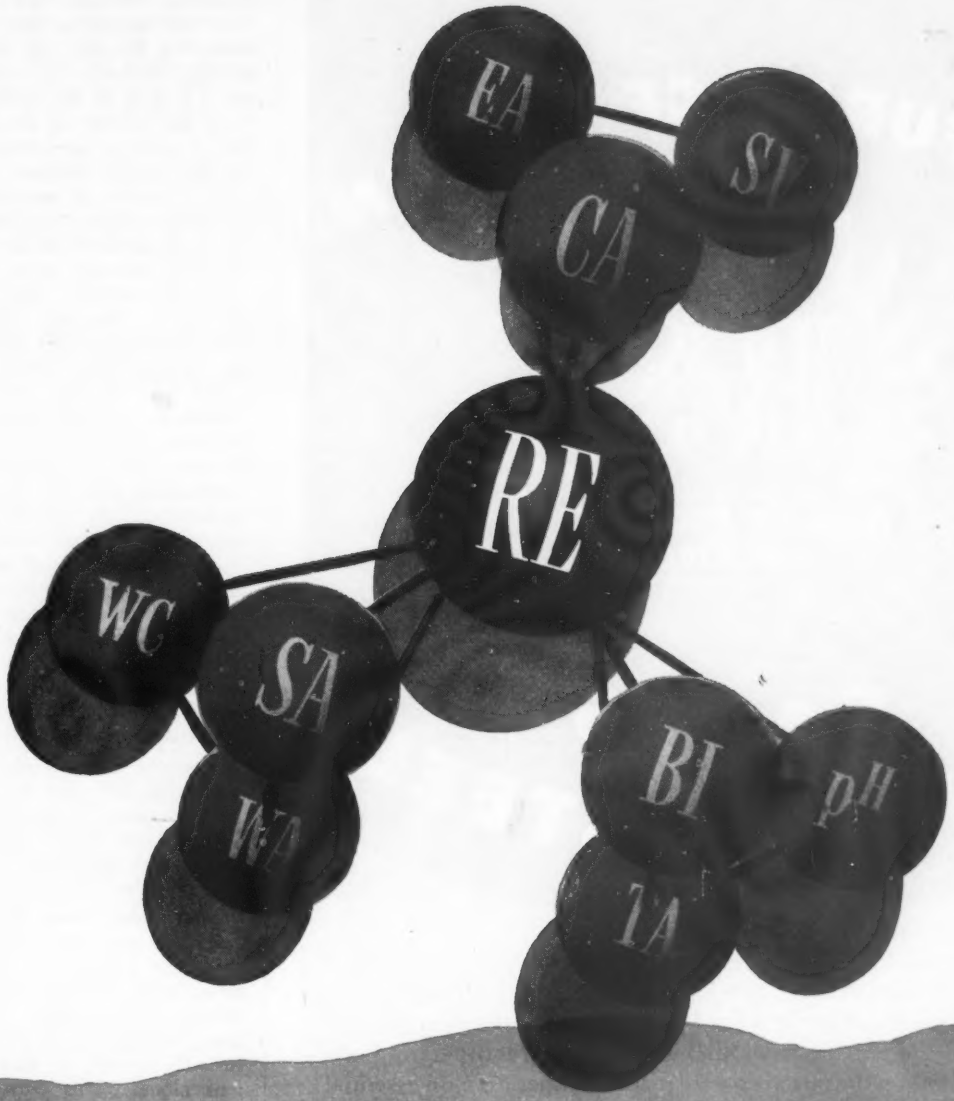
In practical work, this voltage is determined by drawing straight lines along the principal slopes of the curve as shown in Fig. 6 and then taking half the vertical distance to determine the half-wave potential as at Fig. 2.

The identifying half-wave potential has been ascertained for many elements and these values have been tabulated and standardized. However, if there is any doubt as to the element in question, it is easily verified by adding some of the element to the solution and running another polarogram. If this second polarogram shows a higher step than the first polarogram, it is probable that the material added is the same as that questioned, because the quantity of material determines the height of the step as explained below.

How Amounts Are Determined: Let's look at Fig. 4 a moment to find out a little more about the action that occurs. This is a typical current-voltage curve obtained with the dropping mercury electrode in an air-free solution of 0.013-molar zinc sulphate and 0.1-normal potassium chloride. Note that as the applied voltage is increased, very little current flows until the decomposition potential (or "discharge" voltage) of about 1 volt is reached.

At this point, the current begins to increase rapidly, due to the beginning of a chemical reaction called electrolysis that takes place under the influence of the applied electromotive force (voltage). This reaction consists of the discharge of zinc ions at the dropping mercury electrode to form an extremely dilute zinc amalgam on the mercury drop, accompanied at the large quiet anode at the bottom of the cell by the anodic dissolution of mercury and the subsequent formation of calomel.

As the zinc ions are attracted to the



THIS IS WHAT HAPPENS WHEN YOU BATHE METAL

Correctly cleaning metal is no simple operation... these elements must go into action...

Wetting Action *(WA)* must lower surface and interfacial tensions and allow the cleaning solution to penetrate to surface of the base. Emulsifying Action *(EA)* must disperse grease and oil as tiny globules, and by suspension prevent redeposition. Saponifying Value *(SV)* must convert organic fats and oils into soluble soaps, and Solvent Action *(SA)* put soils into solution. Colloidal Activity *(CA)* must disperse solid soils into minute particles which may then be easily removed. Water Conditioning *(WC)* removes or controls the elements which cause water hardness.

Correct Buffer Index *(BI)* assures ability to absorb either alkaline or acid soil, thus prolonging efficiency of the solution. Proper *pH* assures the correct measure of energy of alkalinity and Total Alkalinity *(TA)* must supply maximum active cleaning energy.

In formulating a cleaning compound, therefore, it is obvious that no one factor is a magic key to all problems. The answer is in determining the relative value of *all* these factors as they apply to *your* problem.

Putting these factors into correct balance is a responsibility you can entrust to Turco chemists —a responsibility for which their two decades of Research and Experience *(RE)* have well qualified them. *Take your problem to Turco.*

For a fuller explanation of these vital factors, write for Turco's Booklet on your firm letterhead, please.

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dropping mercury, they give up their electrical charge as they strike it, thus increasing the flow of current and producing the sharp rise seen between 1.0 and 1.1 volts on the curve, Fig. 4.

As the voltage is increased still further, a point is soon reached where the solution cannot continue to increase the rate at which it supplies ions to the dropping mercury electrode. This causes the curve to level off and soon reach a "limiting" current value.

Fig. 7 explains this action further. Starting at the left, zero voltage, the area indicated by the slanting line shows the cathode capacitance current, also called the "residual" current. Area indicated by vertical lines shows the acceleration due to discharge of ions at the dropping mercury electrode after the decomposition potential has been reached. Horizontal lines indicate area in which deceleration is experienced due to diminishing concentration of ions at the dropping mercury cathode (diminishing because the voltage being applied attracts them to the cathode faster than the surrounding solution can supply them, as a certain time interval is involved in diffusion of ions from the solution to the immediate neighborhood of the cathode).

After the curve levels off, it continues to rise slightly due to residual current until a voltage is reached which causes a second set of ions from another substance to discharge, causing another "step" on the curve.

It is evident from the above, that the height of any step must be dependent upon the amount of ions (of that material) in the solution; that is, the concentration of those ions. This vertical distance on the curve indicates the "diffusion" current, or that caused by the ions alone. This current is thus proportional to the concentration and independent of applied voltage.

Since the concentration in turn is directly proportional to amount of that element in the sample, the height of the step can be interpreted to show the percentage of the element that is present.

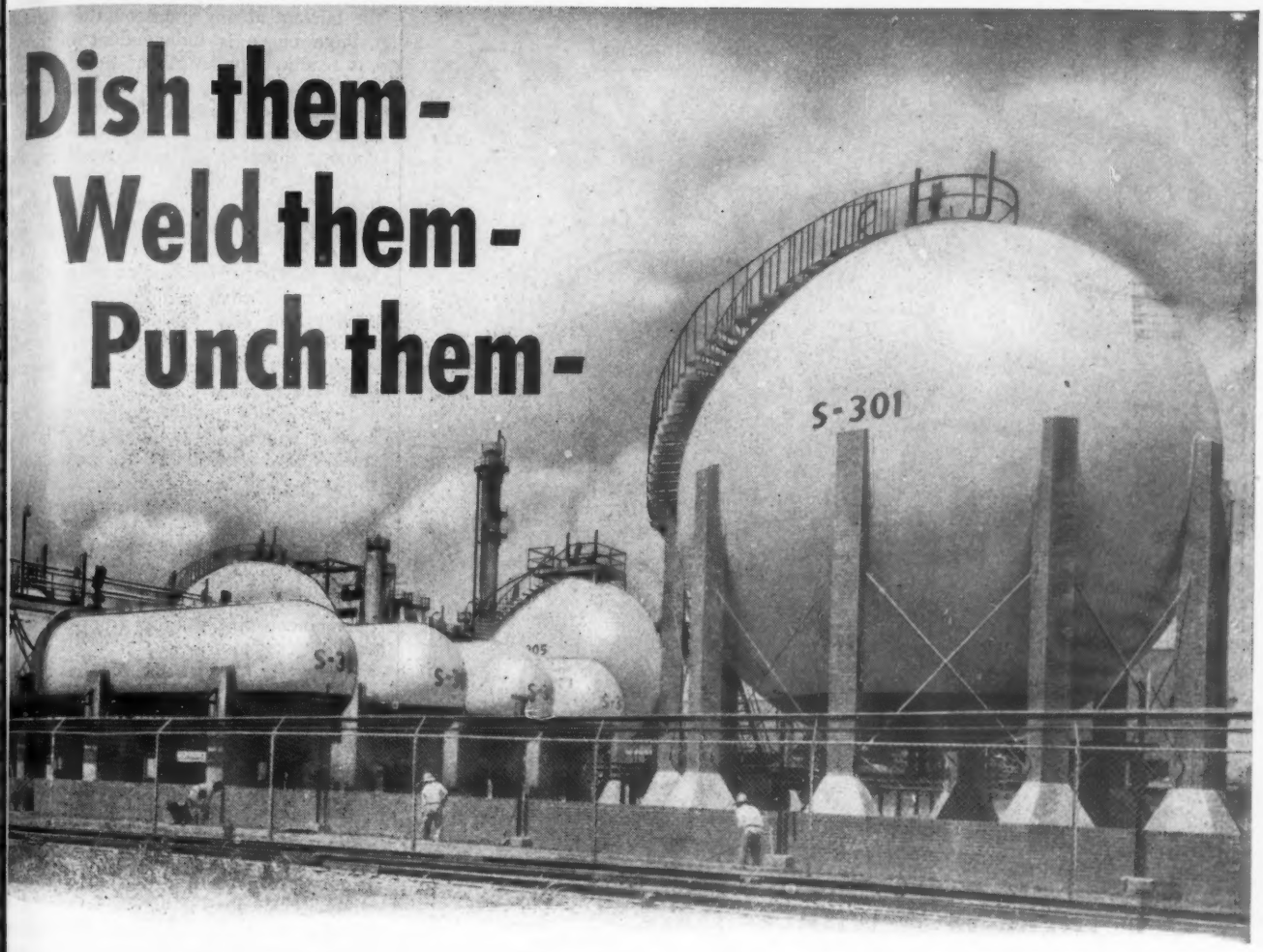
Also important, the height produced by a given percentage can be varied through wide limits by changing the composition of the solution. This makes it possible to adjust the sensitivity of the test over a considerable range.

Measuring Height: Step heights are measured by drawing straight lines along the principal slopes of the curve and taking the vertical distance between the points of intersection of these lines, as illustrated in Fig. 6.

Independent of Time: An important feature of the dropping mercury electrode is that the (average) current observed becomes steady immediately after each new setting of the applied voltage and is independent of the time that the voltage is kept at that value. This favorable behavior is due to the continuous exposure of fresh mercury surface by the growing drops.

Phenomena at a given drop are exactly duplicated by its successor.

Dish them - Weld them - Punch them -



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the current at any point on the current-voltage curve is independent of previous reactions or length of time the current has passed. Values for Fig. 4 were obtained by adjusting the voltage to a certain value and reading the current. From a number of such readings, the curve was plotted.

Curves in Fig. 6 were obtained on a polarograph which varies the voltage continuously, starting from zero. Each jump in the curve indicates formation of a drop. Some 150 drops make up each of the two curves in Fig. 6. At rate of a drop every 3 seconds, this would mean that it required only 7½ minutes to obtain each curve.

Drop Action Influences Curves: Perhaps it should be pointed out that the ripples or wavy form of the polarograms shown in Figs. 2 and 6 are caused by the action at the dropping mercury electrode, each drop causing a slight rise in current as it becomes bigger and bigger, followed immediately by a slight fall as the cathode area decreases with detachment of the drop from the electrode.

However, the inertia of the galvanometer movement is designed to minimize these variations.

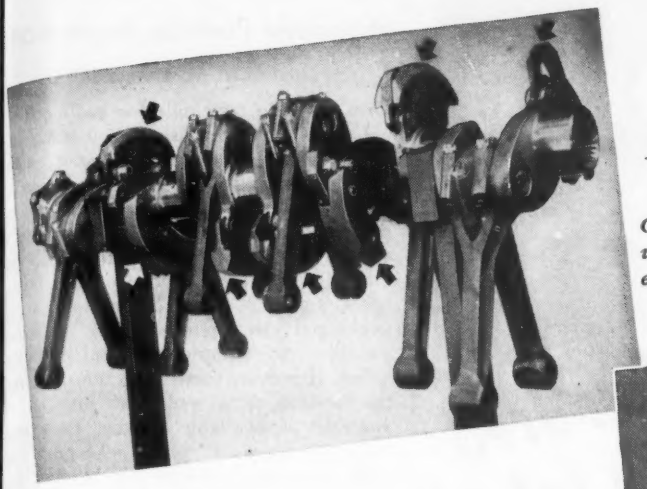
For purposes of illustration, the variations from individual drops have been smoothed out in Fig. 7.

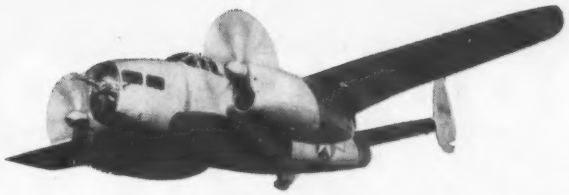
Too, new developments in polarographs are expected to bring about a number of improvements, including elimination of the drop variations entirely. Considerable work has been done by L. A. Matheson and N. Nickols (Trans. Am. Electro-chem. Soc., 73, 193, 1938) with cathode ray oscillographs in making polarographic measurements. Fig. 5 shows an oscillogram record obtained by synchronizing the 30-cycle linear voltage sweep circuit with a fast drop time of 1/30-th of a second. Note its close resemblance to conventional polarograms in Fig. 6.

Continued research on the polarograph shows a trend in the direction of direct chart recording polarographs. Where a large volume of polarographic work is indicated these instruments will justify their higher cost because of the greater speed of operation. Recent advances in recorder design have made it possible to get the continuous recording at high sensitivity which is necessary for polarographic application.

Weight Calculator Features Slide-Rule Principle

A new, pocket-size weight calculator offered by Reynolds Metals Co., 2500 South Third, Louisville 1, operates on the slide-rule principle and shows at a glance comparative weights for aluminum, magnesium, brass, steel, and copper, in any given size of strip or sheet, also for bar and rod, round, square, octagonal or hexagonal, and for wire, tubing and circles. Density tables and a chart of frequently-used decimal equivalents are shown.





Crankshaft of Ranger twelve-cylinder inverted V-type inline engine with connecting rods in place, showing (arrows) Needle Bearing equipped counter-balances.

Needle Bearings Carry Crankshaft Counter-Balance on Ranger Aircraft Engines

Dampener assembly. One bolt is secured through Torrington Needle Bearing, while second bearing is held in place for insertion of second bolt, completing assembly.

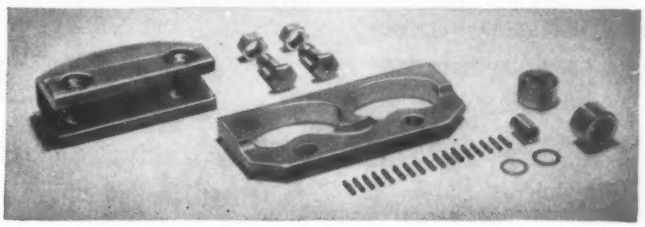
Here is an interesting application of Torrington Needle Bearings—a "cam-follower type" application—in the design of the crankshaft counter-balance of the Ranger twelve-cylinder, inverted V-type inline aircraft engine.

Two modified Type FT Needle Bearings are used to support each counter-weight, which in turn serves as a vibration dampener to provide dynamic balance on the crankshaft at high speeds.

Here again the characteristic advantages of Needle Bearing design are readily apparent: their high unit capacity due to the large number of small diameter rolls: their comparatively small O.D.; and the simplicity of their installation make them ideal for this and many other applications where dependability and long, maintenance-free service life are essential.

Perhaps these features will suggest an application where you can use Needle Bearings to improve efficiency, increase service life or effect cost economies through simplification of design or production steps.

Remember—there's a type and size Torrington Needle Bearing to meet virtually every requirement. If you haven't the latest information on file for ready reference, send today for our combined catalog and application handbook, No. 30-A.



Dis-assembled view shows counter-weight parts, and detail of the modified Type FT Needle Bearing.

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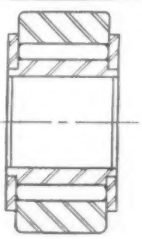

The FT Torrington Needle Bearing designed for Heavy Rolling Loads

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ROUSTABOUT CRANE

Roustabout Cranes
By Hughes-Keenan
Load-Handling Specialists Since 1904

Magnetic Particle Inspection

(*Continued from Page* 128)

form separate terminals for each cell.

Care should be used in making all connections with storage batteries, since a poor connection will result in excessive drop in voltage. The main objections to storage batteries are that they require a certain amount of servicing such as charging and maintenance of the liquid level, and care must be used to avoid prolonged continuous use of sufficient duration to completely discharge the cells. However, these objections are not too serious if a sufficient number of batteries is available so that they may be cared for as a routine job, providing fully charged batteries for use at any time. An ammeter should be used with storage batteries to indicate proper current.

Transformer-rectifier units are generally used as electro-plating units, but are of considerable value in magnetic particle testing. They combine the advantages of both transformers and storage batteries in that they provide direct current instead of alternating current of high amperage, thus obtaining a greater penetration similar to storage batteries, but with far less maintenance required and with more convenience. Unlike storage batteries, they may be used continuously. The power output of these units varies considerably with the unit, but generally an initial rating of 3000 to 5500 amperes for 3 to 5 seconds is provided with automatic reduction to a continuous current of 1200-2000 amperes. These units are usually used where more or less continuous operation is required.

Powders: The powder used in this type of inspection should be a magnetic material of low magnetic retentivity. The particles should be of such size and shape that they are readily mobile over the surface of the part being inspected when the "wet" method is used and will selectively settle when the "dry" method is used under the influence of a weak magnetic field. The color of the powder should offer sufficient contrast to the color of the piece under test so that indications may be readily seen.

Some commercially prepared powders for the "dry" method and pastes for the "wet" method are properly sized and the particles are coated with a compound which helps to prevent agglomeration and thus adds to their mobility. These coatings are also colored so that gray, black or red powders are available. Iron reduced by hydrogen (black), magnetic iron oxide (black), ground hammer scale and "Smooth-on Cement" (gray) have also been used with success in magnetic particle inspection, but are considered to lack some of the sensitivity of the commercially prepared powders and pastes as well as the benefits of the coating.

A paste is commercially available which is fluorescent under black light. This is especially useful in investigating obscure surfaces such as bores, recesses, etc. When a large number of parts have to b

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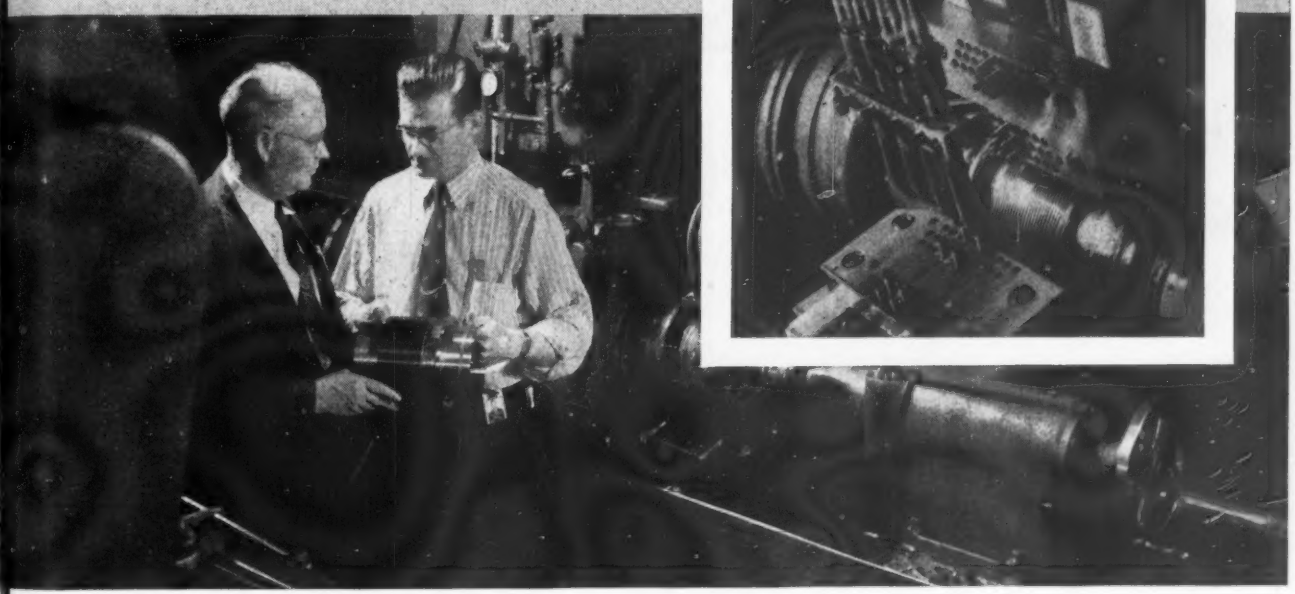
says this Airplane Motor Plant Foreman



(Left) Actual photo of a Gulf Service Engineer consulting with Foreman in plant of prominent Texas aircraft engine manufacturer on cutting oil requirements for finning cylinder barrels. (Right) Close-up of finning operation.

WITH THE CUTTING OIL we formerly used, this machine finned 5 to 10 cylinder barrels r tool change, and 30 to 40 barrels per shift," says is aircraft engine plant Foreman. "With the prop- combination of Gulf Lasupar Cutting Oil and lf Cut-Aid, as recommended by the Gulf Service gineer, output is 15 to 25 barrels per tool change, d 60 per shift."

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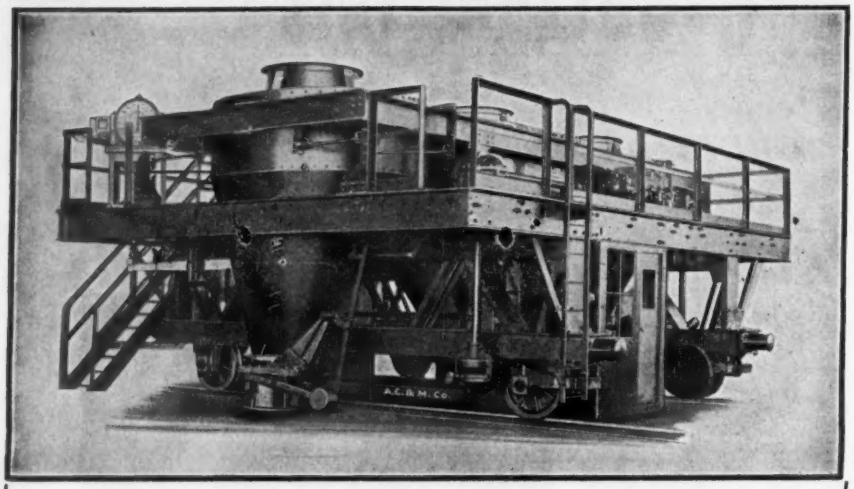

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examined, time is saved due to the better visibility of the indications.

Methods of Magnetization: In selecting the method by which a part is to be magnetized, there are several factors to be considered. The size and shape of the part will determine largely the type of equipment to be used. The type and expected position of direction of defect will determine how the magnetizing current is to be applied.

In general, it should be remembered that the current should flow parallel to the magnetic discontinuities. This will result in a magnetic field perpendicular to the discontinuities, which is the most favorable direction for the production of indications.

The usual technique is to apply the particles to the forging at the same time that the magnetizing current is being passed. This is known as the "continuous" method of inspection. Another technique is called the "residual" method wherein the forging is magnetized first and after the current is stopped the particles are applied. The efficiency of this method depends upon the strength of the magnetizing current and the magnetic retentivity of the steel and will vary for different compositions and heat treatments. Under proper conditions, it is a satisfactory method but may not give comparable indications of sub-surface defects.

When the object to be examined has one axis which is considerably longer than the other, discontinuities lying in a direction transverse to the long axis may be detected by the use of a coil around the outside of the object. The central axis of the coil should be parallel to the longitudinal axis of the object. When an electric current is passed through the coil, a magnetic field will be set up parallel to the longitudinal axis of the object. Thus, transverse discontinuities will interfere with this field, resulting in the formation of local poles.

When the expected defects are in a direction parallel to the major axis of the part, it is necessary to establish a magnetic field, the direction of flow of which is normal to the major axis of the forging. If the object is hollow, as for example a bored shaft, a coil may be formed by passing a cable through the bore. The number of turns will be determined by the amount of current available; 120 ampere-turns (6 coil turns with 200 amperes current) have given satisfactory results in the past on propulsion shafting.

When the object is solid, a method has been used with the coil entirely outside of the object, the axis of the coil being perpendicular to the major axis of the object. While the method of looping the coil around the forging may produce some indications, it is not as revealing as the method described below. Another method sometimes used has the axis of the coil tilted at a large angle to the axis of the forging in an attempt to move the direction of the magnetic field from longitudinal to a diagonal direction. Long objects, such as shafting, strongly tend to resist such a change however, as

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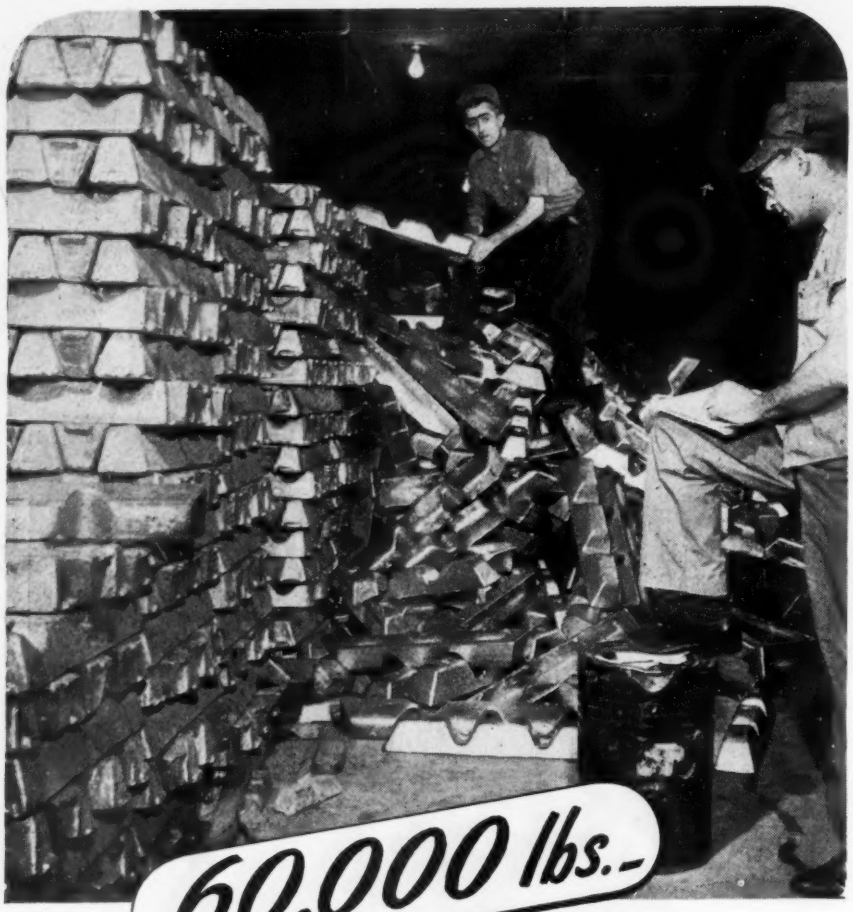

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the method is not considered suitable when a searching inspection is desired.

When longitudinal defects are suspected in a solid object, the most satisfactory method of magnetization is to pass a current directly through the object in the direction of the longitudinal axis. This causes a magnetic field within the object, flowing circularly about the longitudinal axis. It has been found that for larger symmetrical forgings with varying sections, such as turbine rotors, this method is very satisfactory.

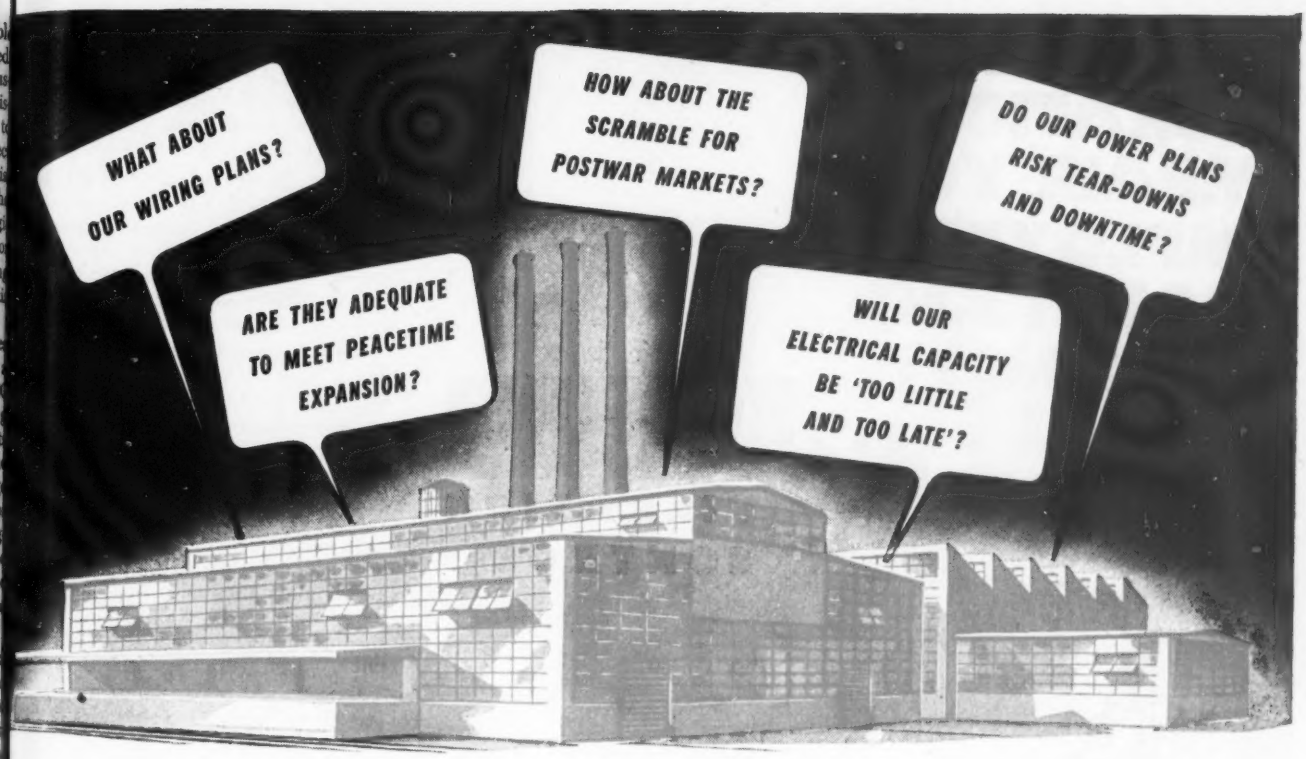
A surge of not less than 2500 amperes for about a half a second followed by a continuous current of not less than 1000 amperes while the particles are being applied is very revealing for defects occurring in the heavy section. For the lighter journal ends, a lower amperage should be used if the same degree of inspection is desired throughout the forging. A modification of this method is the use of a conductor passing through the bore of a hollow forging or lying adjacent to a solid forging.

A modification of the circular field method which is suitable for the examination of local areas is known as the "prod" method. Contacts are made on the surface of the forging along the line of the suspected defect and current is passed between the contacts, setting up a magnetic field. Inspection by this method is limited to the area of the forging between the contacts.

In any inspection involving the passage of current through the part under test, care must be taken to obtain good electrical contact between the electrical leads and the forging. Poor electrical contact will result in arcing and possible burning of a finish machined surface as well as a reduction in the amount of current passed through the specimen. When the forging presents a smooth surface for the attachment of leads copper bus bars may be clamped directly to the specimen. If the surfaces are not smooth, copper braid or mesh will provide good contact.

Portable electro-magnets are sometimes used to impose a local magnetic field. While this is a practical method in many cases, inspection is limited to the area in the immediate vicinity of the magnet and cannot be relied upon for a searching, all-over inspection of a forging, unless the magnet is placed at a sufficient number of locations to cover the entire surface. Even then, high flux densities are difficult to obtain with this equipment.

Determination of Current Required. It is difficult to define the current density necessary to produce the optimum flux density. Much will depend on the composition of the steel, its heat treatment, the type of defect being sought, thickness variations, effect of contour, and perhaps other variables. With very low flux densities, objectionable defects may not be revealed and, on the other hand, with very high flux densities, undue prominence may be given to inclusions of normal size, slight surface irregularities and other unharmful conditions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Vibration and its ever-present partner, noise, have been proven by scientific study to have a serious effect on the health and efficiency of industrial workers. Nervous ills, headache, deafness and excessive fatigue, resulting in higher accident rates, can be caused by uncontrolled vibration. Vibration and noise from drop hammers, punch presses, and other impact machines are among the causes of absenteeism in industry.

An industrial plant in which adequate vibration control equipment has been installed under the direction of Korfund engineers is a safer, healthier place to work. Increased employee good will and efficiency as well as lower industrial insurance premiums are the results.

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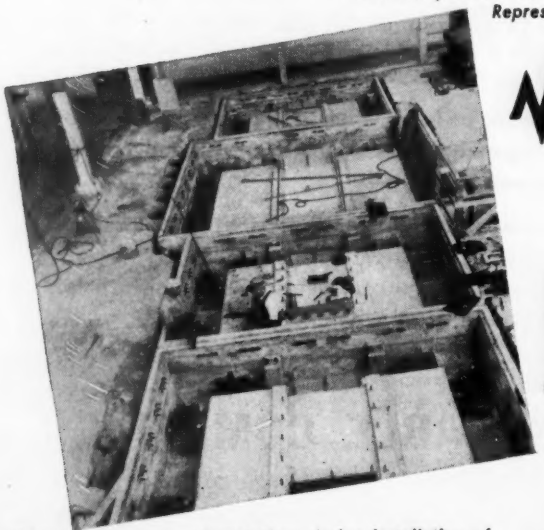
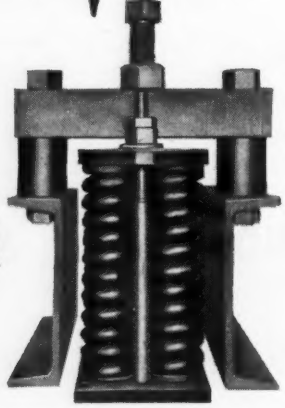


KORFUND VIBRATION CONTROL



Above—Drop hammer foundations during installation of Korfund Isolators.
Right—Typical Korfund Steel Spring Isolator.

well as causing channeling of the powde if the "wet" method is used.

The desirable operating range is prob ably between the maximum permeabilit region and a point well below the mag netic saturation of the steel.

At the present time, various types o magnetometers are used for measurin the magnetic flux. An instrument de signed for this purpose is commercially available. It is needed in order that forg ings, regardless of section, can be teste under standardized conditions.

Application of Powder: While the forg ing is properly magnetized, the powde may be applied by either of two method commonly called the "wet" method and the "dry" method. In the "wet" method the particles are suspended in a liquid such as kerosene or light clear oils; various oil companies now prepare ligh clear oils which do not have a seriou fire hazard and do not evaporate quickly. The liquid is then flowed or sprayed over the surface of the part to be inspected. By this means, the particles are brough into contact with the entire surface.

Care should be taken to regulate the flow of the liquid over the surface gently until the magnetic indications are de veloped, but not washed away by the force of the liquid.

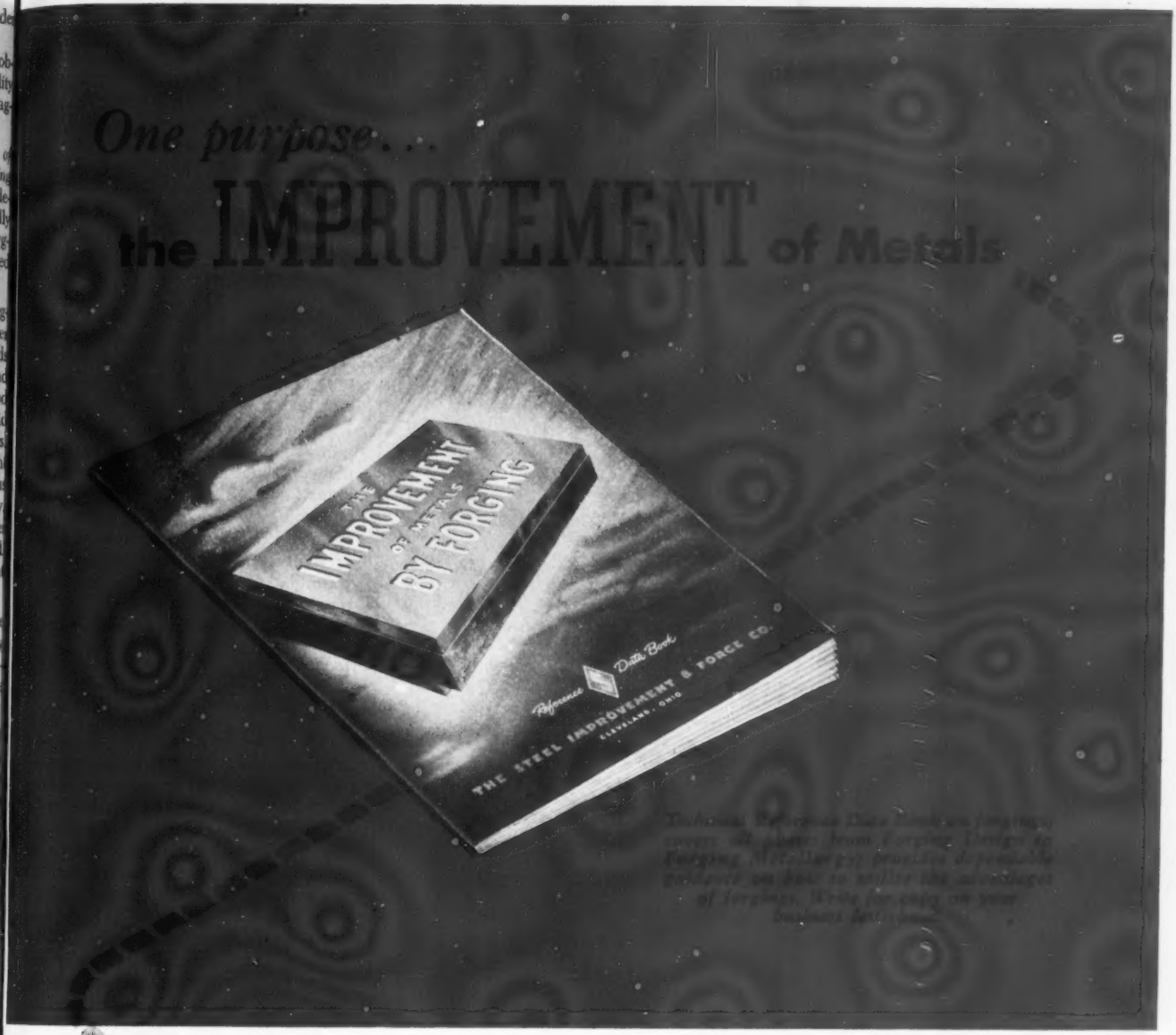
In the "dry" method, the particles are applied from a hand shaker (such as a salt shaker), bulb blower, or a mechani cal blower. The use of the shaker is limited to flat and nearly hor.zontal sur faces, whereas the blowers may be used on vertical or overhead surfaces. The powder should be applied by dusting into still air adjacent to the forging and allowing it to settle evenly on the surface. Too much powder is disadvantageous as it masks the patterns. Care should be exercised in blowing off excess powder not to disturb the indications.

Interpretation of Results: Having pro duced a magnetic particle indication or pattern, the inspection job is not complete until the indication is properly interpreted as to type, size and position of defect, and the results of the test properly re ported so that one who has not seen the test may be in a position to pass on the acceptability of the forging. Furthermore, the service of the forging must be con sidered.

Obviously, what is an acceptable im perfection in the bore of a hollow propul sion shaft may be cause for further in vestigation in a rotor forging. Thermal cracks are undesirable in all forgings because their sub-surface extent is diffi cult to determine, and because their sharp edges make them potential stress-raisers.

Cracks originating in the surface, such as laps, seams, etc., are usually found by routine forging inspection and magnetic particle inspection is not intended to see out such defects in heavy forgings, ex cept when machined. Its principal use in connection with these defects is as an alternate to etching in determining if a surface defect has been entirely removed.

Thermal cracks have several charac teristics which aid in their identification



by Forging

How will recent developments in the use of forging techniques for forging so-called impossible-to-forge designs affect the post-war preference for your product? An ever-broadening technical knowledge concerning the IMPROVEMENT OF METALS BY FORGING, and the application of forgings, is available through our engineers who, throughout 31 years of forging production experience, have helped to make marked improvements in many products. Ask a Steel Improvement Forging Engineer how to utilize the strength and toughness of forgings to increase preference for your products.

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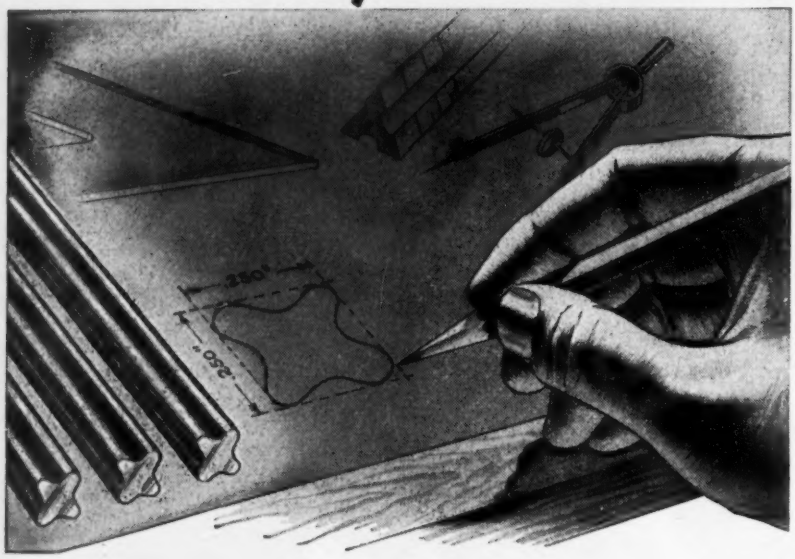
PAGE *Shaped* WIRE



YOU DRAW THE *SHAPE* . . .
PAGE CAN DRAW THE *WIRE*

Certainly **PAGE** is now drawing wire in many shapes—triangles, rectangles, octagons, hexagons, keystones, ovals, half-rounds, many other hard-to-describe special shapes. If you have use for shaped wire in the manufacture of your product, you are not limited to standard shapes. You draw the *shape*—**PAGE** can draw the *wire.*

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On a transverse section they tend to occu as radial cracks in a circular zone extend ing from the center of the forging excep in hollow forged parts where their direc tion may be circumferential. On the out side and inside surfaces they do not show unless machining operations cut into the zone of thermal cracks and then they usually show as longitudinal cracks paral lel to the axis of the forging. They may also occur randomly oriented.

If the forging is fractured through the mating surfaces of a crack, the exposed surface of the crack would appear as a round silvery disk having the appearance of a snow flake, hence the name. They are usually associated with heavy, rather than light forged sections of alloy steel and rarely occur singly.

Since these cracks occur at varying dis tances from the center of the forging magnetic particle indications on a ma chined surface will be of varying length and intensities, depending upon whether the crack lies entirely below the surface or whether it has been machined partially through. In the former case, the indi cations will be lightly held and will be broad and not sharply defined, depending upon the depth at which the defect lies below the surface.

Thermal Cracks Not Visible

When the defects have been machined partially through, the magnetic particle indications are strong since the remainder of the defect is at the surface, and the length of the indication will vary accord ing to the amount of the defect which remains in the steel. Thermal cracks may not be visible at low magnifications ex cept when the steel is etched, whereas inclusions, described in the following section, can usually be seen without the aid of etching or magnetic particle inspec tion when they occur at the surface.

Inclusions are nonmetallic material which become entrapped in the original ingot. When the ingot is forged or rolled, these nonmetallic particles usually are deformed, either to long string-like inclusions or to flat patches. The mag netic particle indication for an inclusion is usually a wider and more lightly held band of powder than is the indication for a crack. This is due to the round shape of the inclusion which offers less resistance to passage of magnetic flux.

To differentiate between an indication caused by an inclusion and one caused by a crack, it has already been mentioned that the powder is usually more lightly held at an inclusion than at a crack. In addition, an important difference be tween inclusions and thermal cracks is that on transverse sections inclusions usually will appear as small round dots whereas thermal cracks will have appreci able lengths. On longitudinal surfaces inclusions can usually be removed by grinding to a slight depth; whereas a thermal crack, if it has not already been partially or almost completely removed by previous machining, may require ex cavating to a considerable depth to accomplish its removal.

Segregations of phosphorus or "ghosts

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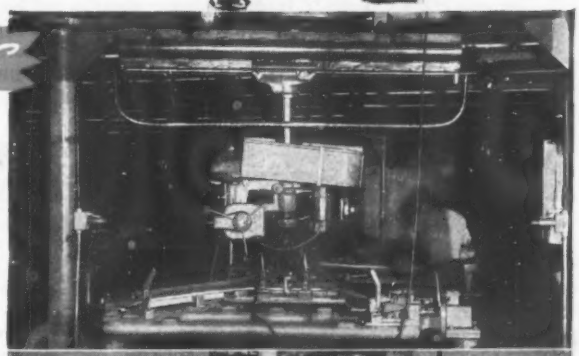

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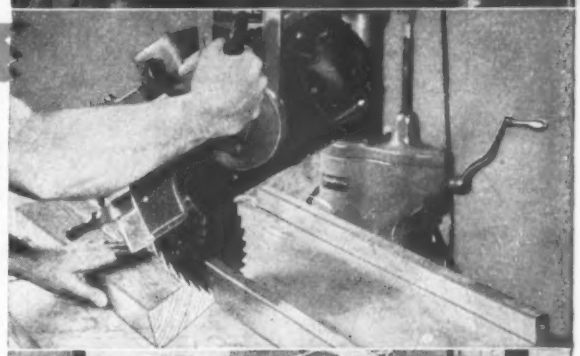

W-T Radial Saw cross-cuts, rips, dadoes, miters, routs, tenons, Also available in metal-cutting model.

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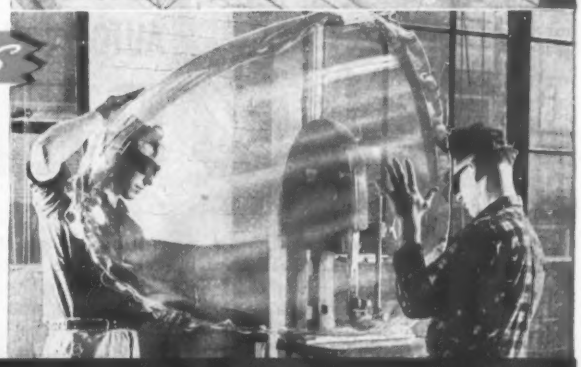

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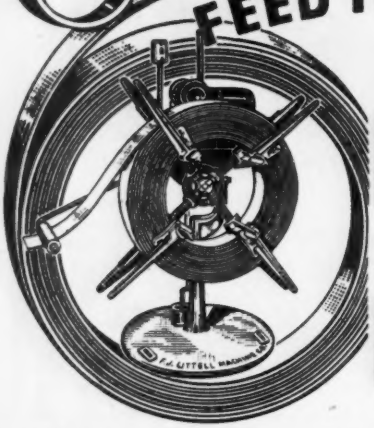

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may effect a change in the magnetic properties of the steel so that magnetic particle indications will be obtained. The indications are usually long, wide, and lightly held. Etching with Stead's reagent will show the segregated condition in the area. The bore of the forging should also be reinspected visually and the end of the forging etched since "bursts" are sometimes associated with a segregated condition of this type. A deep-seated crack or "burst" could develop magnetic particle indications which somewhat resemble those developed by "ghosts".

While inclusions and cracks can both give strong and somewhat similar magnetic particle indications, the interpretation of the indications are entirely different and independent. Inclusions being round in shape are far less weakening than the notch effect caused by cracks. The effect of cracks in reducing the endurance limit is far greater than the effect of well-rounded inclusions.

Magnetic particle indications are sometimes obtained which, because of their location or appearance, may be difficult to classify.

Forging Flow Lines Recognized

Forging flow lines should be readily recognized, especially when the inspector has familiarized himself with their appearance on etched sections of forgings. Their appearance in a magnetic particle test is merely indicative of high flux densities.

False indications may sometimes be obtained, but should not confuse an operator after some experience. Some of the causes of false indications are distortion of field due to irregular shape of specimen or to asymmetrical disposition of the magnetizing coil; rough or dirty surfaces which cause a mechanical (rather than magnetic) holding of the powder; magnetic writing, produced when a piece of steel is rubbed against another piece of steel which has been magnetized, causing a local "leakage" of the magnetic field; cold-worked areas, possibly imperceptible, sometimes caused by lifting slings rubbing on the surface of the steel or by the withdrawal of a boring tool; abrupt changes in section.

Large deep-seated defects may be indicated by a local discontinuity in the particle pattern, or by a wide, lightly held band of particles. In either case, the same type of indication will reappear as often as the forging is remagnetized. It is sometimes helpful to magnetize the forging in a different direction so that a more definite indication may be obtained.

When an indication of doubtful origin is obtained, the operator should remove the first indication and examine the surface for machine marks, nicks, grease or other possible means by which the particles might be mechanically held. After possible causes of this nature have been removed, the forgings should then be remagnetized and again inspected. If the indication persists, it would then be well to demagnetize the forging in order

to eliminate any possibility of magnetic writing.

Abrupt changes in section will sometimes cause the powder particles to bridge across a sharp corner so that normal defect indications may be hidden. When this occurs, the current should be lowered to the point where bridging does not take place. After inspecting the area of the change in section, the current may be again increased for the inspection of the remainder of the forging.

Demagnetization: Some forgings have high magnetic retentivity which, in later machining stages, may result in the small chips clinging to the tool in such a manner as to scratch or otherwise damage the surface. Demagnetization is the obvious remedy. Sometimes it is desirable to demagnetize while conducting the test before remagnetizing.

When direct current is used, demagnetizing is usually accomplished by repeatedly reversing and progressively decreasing the magnetizing current. When the current has been reduced to the vanishing point, the part should be practically demagnetized. Direct current is recommended for demagnetizing large parts.

With alternating current, it is necessary merely to decrease the magnetizing current in small steps or continuously to a very low amperage. Small parts are demagnetized more easily by passing them through an alternating field.

Aluminum Used for Hammer Heads and Faces

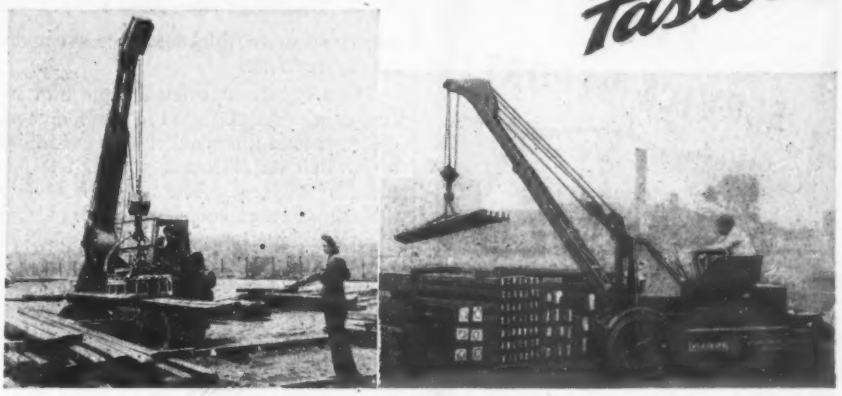
Mallets and replaceable face hammers with aluminum heads and faces are made available by Greene, Tweed & Co., Palmetto building, Bronx Blvd. at 238th, New York 66. They were developed to replace other types of soft faced striking tools and to provide a single mallet or hammer for work requiring a soft faced striking tool.

Besides being spark-proof and easily machined for refacing, aluminum is not brittle and does not chip. Compared to other materials used in replaceable face hammers, aluminum is said to be tougher and more enduring than leather or plastics, and to withstand impacts better than copper or babbitt. According to the company, this material is shock absorbent, minimizing operator fatigue, and it absorbs metal chips because of its lasting softness.

When worn, aluminum heads or faces are easily cut, turned or ground for longer use. Split jaw design of the Basa hammer head further assists quick replacement of faces. Aluminum faces are interchangeable with plastic, rawhide, copper and babbitt faces previously supplied.

Aluminum used is a special alloy, developed to outlast other material suitable for use in soft-faced striking tools. Proportions of mallet heads and hammer faces have been carefully worked out to provide well balanced tools that are easy to handle.

HOW TO HANDLE STEEL *Faster*



Move a KRANE KAR up to a pile of forgings, bars, blooms, billets, ingots, castings (or a scrap heap when equipped with an electric magnet), and top the boom with the full load. Transport load forward or backward and position it on either side in places inaccessible to a rigid boom crane. Make speed with the all-around safety features—stability without jacks or outriggers; automatic braking of boom and load, easy steering, and utter simplicity of operation. Write for catalog.

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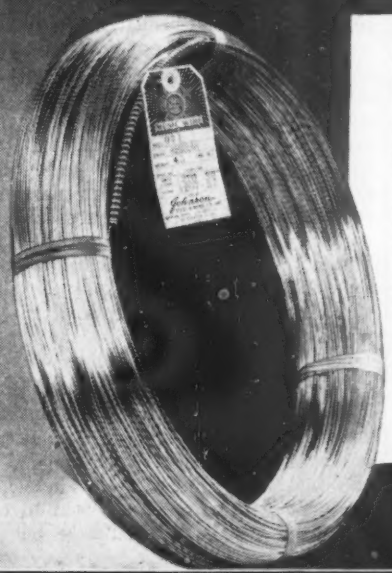

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Supersonic Measurement

(*Continued from Page* 131)

makes accurate thickness measurements readily feasible.

The Crystal: A small flat piece of X-cut quartz crystal is used in the Sonigage. Quartz cut in this manner changes thickness when an electrical potential is applied to its faces. The action is reversible and instantaneous so if a high frequency alternating potential is applied to the quartz plate faces the crystal will change thickness rapidly at that frequency. This forced mechanical vibration can be transmitted to any material by placing one face of the quartz plate in contact with it. Since the amplitude of this high frequency motion is ordinarily only a few billionths of an inch, good coupling such as that provided by an oil film between the crystal and the work is required. Brushing the work with oil before testing is sufficient.

A typical Sonigage crystal holder and cable is shown in Fig. 2. In this unit, the quartz is about one inch square and sixty thousandths of an inch thick. It is silvered on one side to form an electrode and the work serves as the other electrode. The crystal is cemented in a bakelite button which can move up and down between stops in the holder. The holder has tripod feet for stable seating on the work. A coil spring presses down on the silvered crystal face to keep the quartz in contact with the work. This spring also applies the voltage from the shielded cable center conductor to the silvered crystal electrode. The grounded cable shield is connected to the holder and thus by contact through the tripod feet, the work is grounded.

The Oscillator: The oscillator is a simple one-tube variable-frequency type as shown in Fig. 3. Its power output is indicated by a direct current milliammeter in its place circuit. By using an efficient coil and good insulation the oscillator power losses are kept low so that the normal plate current is small. The variations in this no-load plate current encountered in the oscillator frequency range are compensated by adjusting the special loading plate on the tuning condenser. This small constant plate current is then balanced to zero on the meter by the bridge circuit in which the meter is connected. With this arrangement the meter will read only the additional external power output of the oscillator which is drawn by the crystal when the work is in resonance with the oscillator frequency.

It is perhaps well to point out that quartz crystals have their own natural resonant frequencies which depend on the thickness of the quartz. These fixed frequencies are sometimes used to control fixed frequency oscillators but the Sonigage has a variable-frequency oscillator whose frequency is controlled by its coil and tuning condenser. The Sonigage oscillator controls the forced vibration of the quartz and the crystals used are always chosen so that their natural resonant frequency is higher than the

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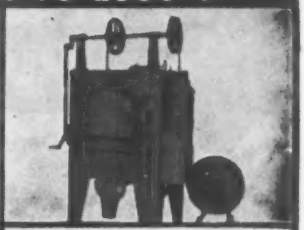

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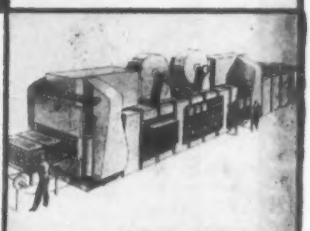

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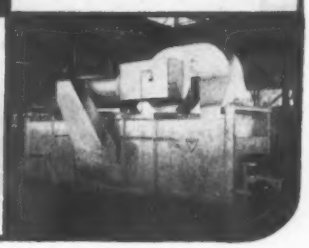

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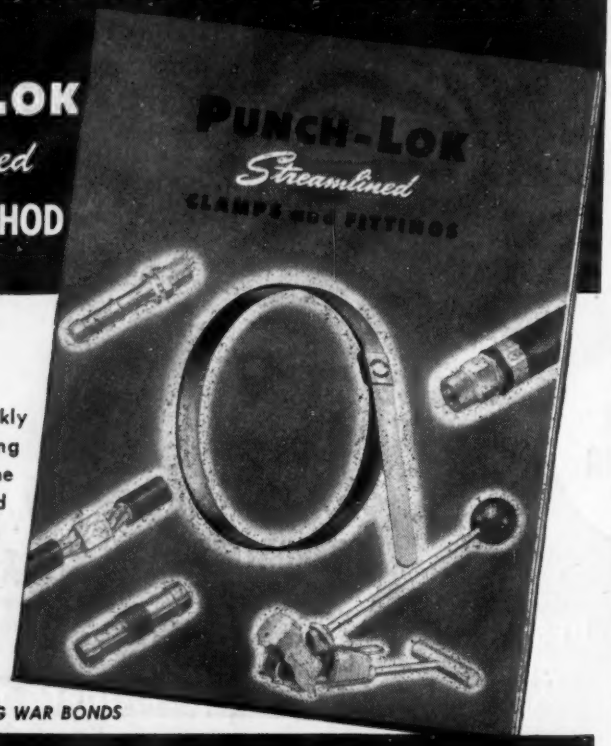

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No. 3

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range used for measurements. The even if crystal wear occurred, the quar thickness would be smaller and its re onant frequency still higher so that n crystal resonance would be observed.

A single crystal is sensitive over abou a two-to-one range of thicknesses so tha Sonigage oscillators are built to cover single two-to-one frequency range. Ad ditional ranges would require changin coils, crystals, and dial scales. Becaus of the low cost and extra inspection ca pacity of separate units no such multi range models have been built.

The oscillator tuning condenser dia can be calibrated in frequency but fo any one metal it can be calibrated t read thickness directly. This is becaus the product of the resonant frequenc and the thickness will equal one-half th velocity of sound. For any one meta this velocity is a constant and, therefore the frequency and thickness are inverse ly proportional.

The Work Vibration: For steel th relation is f X t = 125,000 where f is th frequency in kilocycles per second, t the thickness in thousandths of an inch and 125,000 is one-half the velocity o sound in steel in inches per second. For tunately the velocity in steel is not ap preciably affected by ordinary alloy con tent, hardness, or heat treatment, so tha one calibration holds for all commo steels.

Other metals have different sound ve locities and would require different cali brations or the use of conversion factor A few of the common metals and alloy tested on the Sonigage are: steel, alu minum, brass, copper, silver, and stain less steel.

The amplitude of resonance as indi cated on the oscillator meter may be les if the crystal has less contact area wit the work due to dirt, lack of oil, o curvature of the work. The indicate peak, however small, will nevertheles still be within the 2 per cent accurac of the Sonigage.

If the crystal is only over a small are of a given thickness, then only a smal indication will be obtained but the ac curacy of the thickness measuremen will be unaffected. If the remainder o the crystal contact area is over anothe thickness (as a stepped section) then an other indication will be found at tha thickness if it is within the range of th instrument.

It is also possible to observe with th Sonigage harmonics of the fundamenta thickness vibration such as the second third, fourth, etc. The indicated resonan amplitudes of such resonance points wi be successively smaller than the funda mental indication and this should identif them as such. In the application to th Aeroproducts propeller blade the thick ness of the parts before fabrication i known and subsequent operations ma decrease but not increase this thick ness. In this case Sonigages were de signed so that the original thickness fel in the thick end of the range. The thick ness can, therefore, be measured unles it is about half the original thickness o

F ingerprints
B reed
I mperfections!

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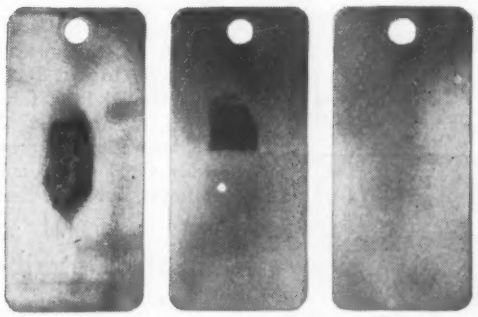

Three plates fingerprinted. Left — dipped in kerosene; Center, half submerged in Cosmoline Fingerprint Neutralizer; right, completely immersed, fingerprint gone.

Houghton's RUST Preventives

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MAKE ONE BEARING OUTLIVE TWO

LUBRIPLATE No. 205 is a lubricant developed for use in grease type anti-friction bearings operating at speeds from 5000 RPM to 20,000 RPM. Users of high speed machinery tell us that this remarkable lubricant often more than doubles the life of bearings. For the lubrication of anti-friction bearings with oil type housings LUBRIPLATE No. 1 or No. 2 is recommended depending upon the operating speed.

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No. 107—One of the most popular grease type products for general application by pressure gun or cups.

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No. 130-AA—Known nationwide as the superior lubricant for open gears, heavy duty bearings, wire rope, etc.

BALL BEARING—This is the LUBRIPLATE lubricant that has achieved wide acclaim for use in the general run of ball and roller bearings operating at speeds to 5000 RPM and temperatures up to 300 degrees F.

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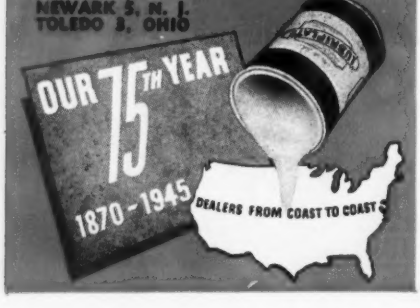

less, in which case no indication occurs and the part is rejected as undersize.

In the more general case where the thickness of the work is not known, then the harmonic indications may appear on the dial at points which correspond to one-half, one-third, one-fourth, or other fractional parts of the actual thickness. For example, in such a case the indication might appear on the dial at 0.070-inch and the actual thickness of the sample might be 0.070-inch (in which case a large meter indication would be obtained), two times 0.070-inch or 0.140-inch (weaker indication), three times 0.070-inch or 0.210-inch (still weaker), etc. The thickness in this case cannot be less than 0.070-inch or in between 0.070-inch, 0.140-inch, 0.210-inch, etc. When two or more of such a series of thicknesses are possible, the actual thickness still can be determined by the Sonigage alone. Two adjacent harmonic dial readings R_1 and R_2 are taken. Since these will be $\frac{1}{n}$ and $\frac{1}{n+1}$ of the total thickness t, then $R_1 = \frac{t}{n}$ and $R_2 = \frac{t}{n+1}$. The solution of these two equations yields $t = \frac{R_1 R_2}{R_1 - R_2}$, or the product of two adjacent readings divided by their difference is the actual thickness.

Conclusion: Briefly it can be said that the Sonigage is an instrument for rapidly measuring the thickness of metal sections in the approximate range 0.020-inch to 0.400-inch with a maximum error of less than 2 per cent. It requires contact with only one surface of the object being measured. The simplicity of operation is such that no particular skill is required.

It has been used to measure the thickness of propeller blade walls and it should be applicable to other inspection problems where rapid inspection of sections is necessary.

Acknowledgment

The author would like to express his sincere appreciation to Dr. E. J. Martin and Dr. G. M. Rassweiler of the Research Laboratories, for their able direction of the research work on the Sonigage; to Mr. R. F. Marsh of Aeroproducts Division for his help and patience in applying the instrument to the inspection of propeller blades, and to Mr. C. E. Quinn of the Research Laboratories, for excellent construction design.

Bulletin Describes Grinder

A four-page illustrated bulletin describes a 4-inch type C cylindrical grinder manufactured by Norton Co., Worcester 6, Mass. Machine features compact controls and adjustments, maximum operating convenience, variable work speed over wide range, tested and proved wheel spindle and 12 and 18-inch lengths. Three types available are plain, semiautomatic with manual control, and semiautomatic with automatic control.

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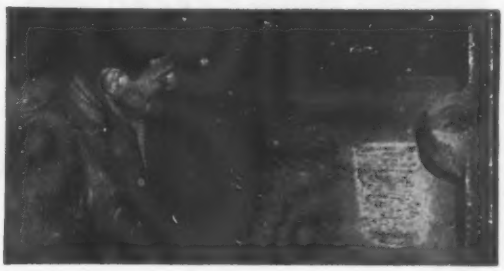
It has always been the policy of the Metal & Thermit Corporation to pay special attention to the development of electrodes for welding special steels. Murex Carbon Moly. 50, Molex and Type M, for example, are outstanding in their performance for welding carbon-molybdenum steel plate, castings, high pressure, high temperature piping and pressure vessels. Murex R.C. and C.F., for the repair and welding of air-hardening steel castings are among the electrodes developed to meet the needs of war production.

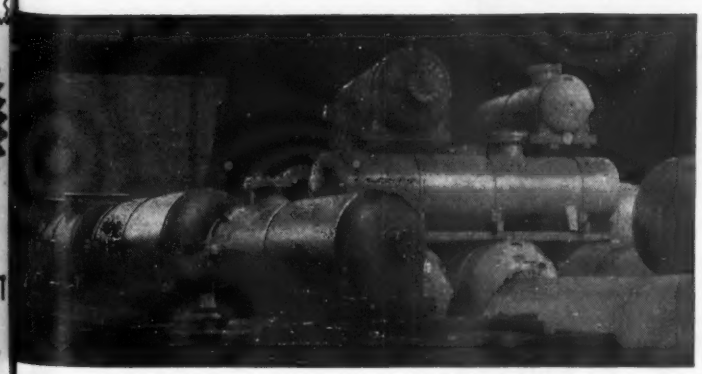
As the electrode requirements of fabricators change with the advent of industrial conversion, suitable Murex Electrodes will be available.

PROVIDING HEAT AND FRESH AIR FOR OUR COMBAT VESSELS, these heating units, produced by McQuay, Inc. of Minneapolis, must be rugged to withstand gunfire shock and near miss bomb concussion. To combine sturdy construction with light weight, welded construction using Murex Electrodes was adopted for the heater casings.

HUGE TURBINES FABRICATED WITH MUREX ELECTRODES by S. Morgan Smith Company, world's largest exclusive turbine builder. The illustration shows welding of a three-way branch inlet of a Vertical Impulse Turbine. Advantages of arc welding are: elimination of possible defects of complicated castings; less metal used; figuring of exact weights possible, thus enabling manufacturer to keep within estimates. Down-hand Murex Electrodes are used.



THIS 7½-TON STEEL CYLINDER on an 800-ton hydraulic press developed a crack 20 inches long and after preparation for welding 3 inches wide, and from 4½ to 6½ inches deep. Preheated 9 hours at about 700° F., this temperature was maintained during 17 hours of continuous welding with Murex Type F ¼ inch rods. The Detroit & Cincinnati Welding Company report that cylinder wall distortion was only about .0015" and that the flange moved only .004".



PRESSURE TANKS FOR HIGH OCTANE GAS, produced in quantity by The Chicago Company of New Haven, Connecticut, are welded with low alloy Murex Electrodes to withstand pressures of from 100 to 600 pounds.

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Shenango-Penn's centrifugal process gives castings a head start—greater density, more uniform grain structure, higher tensile strength, less porosity, no blowholes. No wonder they pass inspection with a very minimum of rejection and are better able to cope with shock, stress, wear and every kind of punishment.

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New Type Grader Unit

(*Concluded from Page* 145)

blade and swings the load as far to the rear as he desires, away from the wall of the excavation, or into a truck for removal.

Another unusual feature is the ability to tilt the blade at any angle to suit the contours of the terrain. Fig. 2 for example, shows how the blade can be tilted at an angle suitable for scraping the loose earth back from the top of the ditch. This particular unit is mounted on a special all-welded trailer half trac constructed of 10-inch steel beams solidly welded into a rigid framework. Other units are mounted on trucks or powered type half tracs.

A conventional type 15 cubic foot bucket, a V-type bucket with 1½ to cross section, an 8-foot grader blade with either a cutting edge or a serrated edge, all interchangeable on the boom permit a wide range of drainage and finishing operations in ditch and road work.

Shielding Doubles Searchlight Beam Power

Beam candle power of a marine-type searchlight, used on Coast Guard and Merchant Marine vessels, is said to be more than doubled by shielding. The problem is to convert as much as possible of the light created by the lamp in all 360 spherical degrees into a sharp, narrow angle light pencil. Utilization of light throughout about 145 degrees has been about the best obtainable with marine type searchlights because attempts to use more often resulted in lack of beam sharpness or light halo, undesirable in fog. In this new searchlight light throughout 290, instead of 145, degrees of the sphere is said to be captured and concentrated into a sharp beam. This and other optical efficiency measures result in a beam candle power of 2,225,000 instead of 1,085,000, according to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

This construction is called a tandem reflector system. In addition to the usual arrangement involving a 1000-watt lamp, polished parabolic reflector and clear-glass front lens, an auxiliary reflector and spill shield are used. The auxiliary reflector is a section of a small sphere placed in front of the lamp to direct the outward rays back to the main mirror and forward in the beam. Ordinarily much of the forward light must be trapped by egg-crate type shields in front of the searchlight. The spill shield is a narrow circular band surrounding the lamp, stopping exit of light that normally makes the edge of the light beam "fuzzy." The area of the main parabolic mirror immediately behind the lamp is blackened so as not to cause a triple reflection, main to auxiliary to main, that also would tend to broaden the beam. Devices which trap stray light resulting from reflections from the inner walls of the lamp bulb itself are included

How Gas advances the science of heat treating

Gas-fired rod annealing furnace; photo courtesy of Selas Corporation of America

Research in Gas application, through the ceaseless study and experiment of equipment manufacturers, independent laboratories and the facilities of the American Gas Association, is constantly producing improvements and new departures in the application of heat, industrially.

For example, heat treating of metal rods in batch furnaces has certain disadvantages, particularly that of uneven heating throughout the bundle of rods. A group of engineers recently perfected a continuous-flow type gas-fired furnace with a ceramic heating unit capable of intense, focussed heat, and closely fitted to the shape of the work in progress.

There are many advantages to this new Gas technique for annealing. For instance, one inch rod stock passing through a six foot furnace of the new type can be heated and quenched at a rate of 12 feet per minute, no section of the metal remaining under heat more than thirty seconds—against 2½ hours in a batch furnace. Furthermore, better uniformity of heating is achieved; scaling, distortion, decarburization are minimized. Floor space for the new furnace is 24 square feet against several hundred feet for the older type. Over-all costs are also considerably reduced.

Consult your local Industrial Gas Engineer for latest developments in industrial heating equipment which may have a direct bearing on your production problems.

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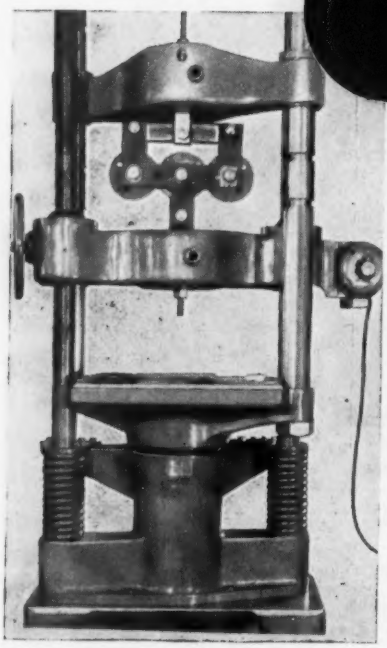

You can judge gears by the standards set for their inspection.

At Fairfield's, the machine testing *static strength* uses three gears, the two outside gears being pulled up and the center gear down. All gears are accurately held on correct center distances and, by means of a bright light and a magnifying glass, the teeth are watched as the load increases steadily up to the breaking point. After a tooth failure, the gears are rotated and test repeated. The method is valuable in comparing the strength of various materials and methods of heat treating, and provides a basis for studying the effect of velocity on gear strength.

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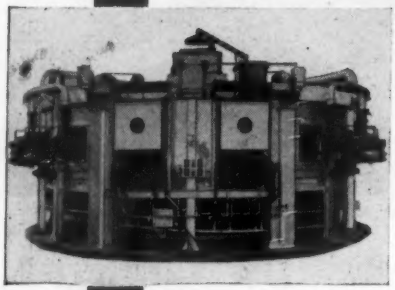

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Drum and Barrel Filler—Designed t handle light or heavy oils, hot or col under pressure or gravity, volatiles, hig density liquids, etc. Equipped wit monel metal tripper; unit is automati flow stops when desired level is reache Pennsylvania Flexible Metallic Tubin Co., 7203 Powers Lane, Philadelphia 4 ST311

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Rust Solvent — Has an affinity f rust itself, but will not attack unoxidize metal. Composed of nontoxic, nonir flammable chemicals which individuall react on rusted surfaces. Applied b brush, spray or dip method and spread evenly leaving no globules. Supplied i concentrated form, it is mixed with equa parts water. Metal surface is rinse with this solution after removing rus Carbozite Corp., First National Ban building, Pittsburgh 22. ST314

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Straight Shank Drill—Produced i sizes ¼- to ½-inch diameter and can b used in all standard drill chucks with out use of special holders. Straight shank end of the drill is produced b giving that end of the fluted section a extra twist which causes the spiral flute to be compressed. Republic Drill & Tool Co., Chicago. ST277

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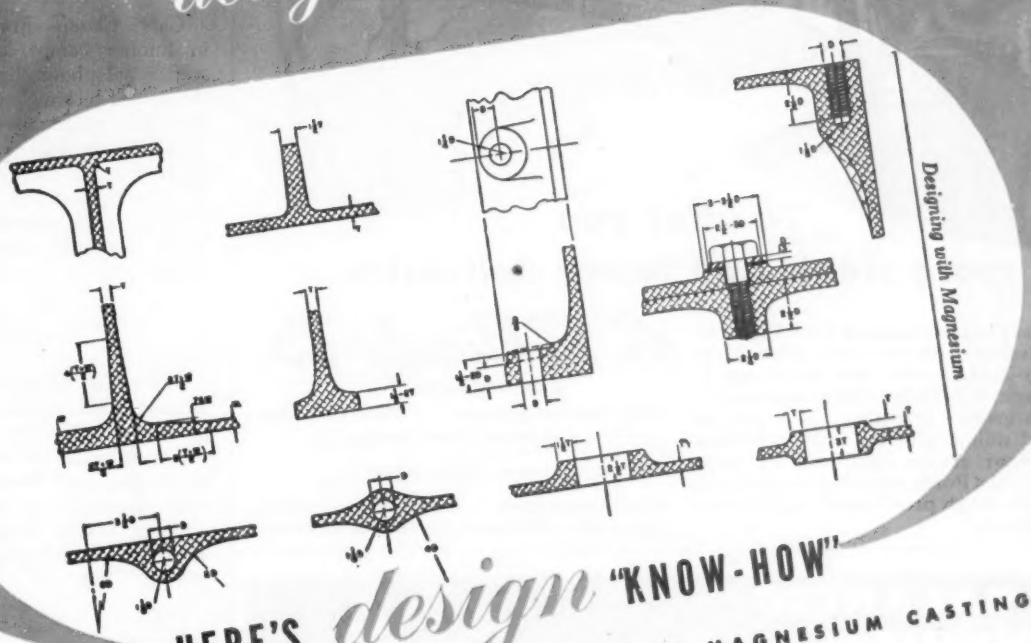

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controls on control panel. Link-Be Co., 207 North Michigan avenue, Chicago. ST317

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Spat—For ankle and foot protection against acids, alkalis, oils, solvents and greases, made from coated fabric giving same protection as rubber but lighter in weight and flexible. Features three snap fasteners at top, two at bottom and an elastic strap fitting under in step. American Optical Co., Southbridge Mass. ST304

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Tape Printer—Developed to enable operator to print a supply to have on hand or to print and immediately dispense exact amount of tape necessary for a particular job. Features waste prevention and simplicity of operation. Top flight Tool Co., P. O. Box 6728, Towson 4, Md. ST303

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Lubricant — An ingredient resistant to chemicals, heat or acid compounded with castor oil essence with gum-forming ingredients removed. Eliminates surface tension and assures a transparent, free-flowing lubricant. It is beneficial to skin, preventing infection and occupational dermatitis. Bonded Oil System Inc., 108 Massachusetts avenue, Boston 15. ST320

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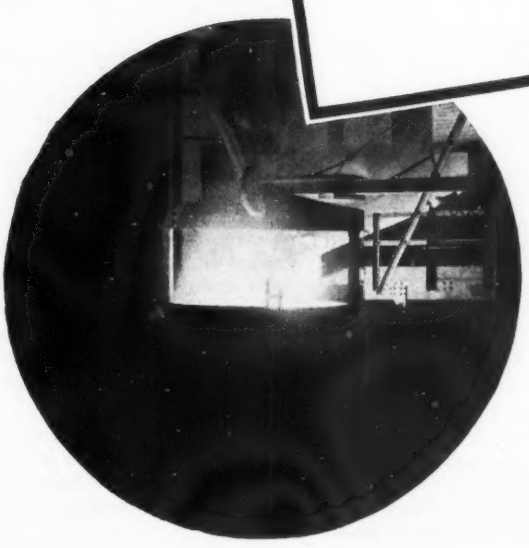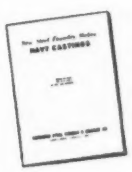

If you would like the "inside" story of Birdsboro's giant, modern steel foundry—one of the world's largest—write for a copy of "New Steel Foundry Makes Navy Castings."

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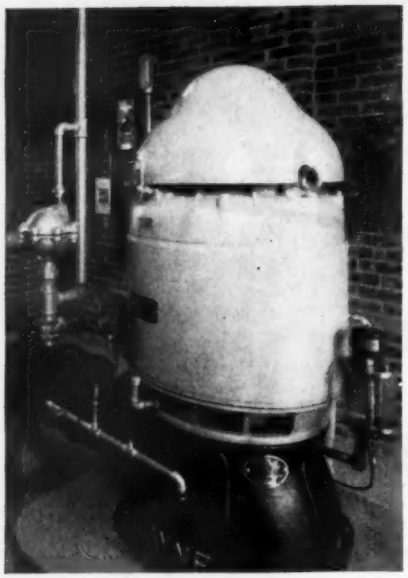

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Book Notes

Air Compressors, How To Install, Maintain

Air Compressors, by Eugene W. Feller; cloth, 460 pages, 5¼ x 8¼ inches; published by McGraw-Hill Book Co. Inc., New York, for $4.50.

This book is intended primarily for the operating engineer and mechanical engineering student interested in air compressors and compressed air. Many available books on thermodynamics are highly theoretical and offer little practical help to the man responsible for operating and maintaining air compressors for industrial use. The material is presented in a way to make the reader familiar with all types of compressors, how they operate and points to consider in purchasing one.

Installation, operation and maintenance information is presented in detail, with special emphasis on engineering practices generally known only to those working on the three separate branches. Many diagrams and halftones illustrate the text and an index is provided.

Second Volume on Arc Welding Designing

Practical Design for Arc Welding, Vol. II, by Robert E. Kinkead; cloth, 100 plates, 8¾ x 11½ inches; published by Hobart Bros. Co., Hobart Square, Troy 1, Ohio, for $3.50. Volume I is available at the same price.

Taking up where the first volume left off, his second volume of practical designs for arc welding presents 100 new and entirely different idea stimulators for use by designers, engineers and fabricators interested in making the most of welding equipment now in use or to be installed.

In selecting the design ideas for this second book the author has paid considerable attention to fabrication of tubular members and connections. Many of these ideas will be found applicable both to piping installations and to tubular structural design.

Business Leadership as It Actually Functions

Business Leadership in the Large Corporation, by R. A. Gordon; cloth, 369 pages, 5¼ x 8 inches; published by the Brookings Institution, Washington 6, for $3.

With large corporations the dominant form of business organization in the United States, what they do or fail to do vitally affects the economic life of the nation. With emphasis on the personal and volitional factor in business leadership the author seeks to discover who are in fact our business leaders and how they exercise their role. The analysis is based on detailed study of organization and functioning of large-scale business. Leadership activities of executives, directors, stockholders, bankers, the government, labor and other affected groups are considered in turn.

The author stresses the key role of the salaried executive, the passivity of most boards of directors and the fact that control by minority groups, bankers and others can mean anything from inertness to active participation.

An important feature is the array of data as to separation of management and control from ownership and as to stockholdings and compensation of managers.

Accident Prevention in New Safety Textbook

Occupational Accident Prevention, by Harry H. Judson and James M. Brown; cloth, 234 pages, 5½ x 8½ inches; published by John Wiley & Sons Inc., New York, for $2.75.

Need for a suitable textbook to serve as a complete and convenient manual became apparent to the authors while conducting courses in industrial safety engineering. Material for this work originated from instructors' notes prepared by them for courses under the engineering, science and management war training program.

The book is designed to meet needs of supervisory employes and foremen interested in industrial safety engineering and includes needs of the supervisory employe as well as the safety director. It is not so much about safety itself as about the fundamentals in plant operation for bringing about accident prevention.

In preparing the volume the authors have attempted to record most of the means by which accidents have been controlled throughout industry in the past to make available this general information.

Training for Leadership

Conference Leader Training, by Edward S. Maclin and Paul T. McHenry; cloth, 77 pages, 5¼ x 8 inches; published by National Foremen's Institute, Deep River, Conn., for $2.50.

The purpose of this booklet is to present in concise form the needs for leadership training and to develop an interest in learning the underlying principles of conference leading through individual study and by observing an experienced leader at work. It also presents in practical form the various devices used in dealing with special situations as well as techniques for planning and leading a discussion.

The ideas and suggestions in this work have been drawn from the authors' experiences and other sources and should be helpful to all attempting to give such training.

Carbon Has Diverse Uses in Purification

Active carbon (activated charcoal) was first prepared in 1900. Successful use of active carbon during World War I to prevent casualties from gas warfare drew widespread attention to its purification properties. Since then, use of active carbon has reached out until today many millions of pounds are used each year to perform an important role in purification of many foodstuffs, drugs, chemicals, plastics, oils and paint, and water supplies, according to a paper read by Dr. John W. Hassler, director of research, West Virginia Pulp & Paper Co., Tyrone, Pa., at the 11th annual chemical engineering symposium of the Division of Industrial and Engineering Chemistry of the American Chemical Society.

Where the product to be purified is or can be made into fluid form, active carbon treatment is accomplished simply by adding a weighed quantity of active carbon and stirring. Impurities in the liquid are attracted to the surface of the carbon, the phenomenon known as adsorption. Active carbon containing the impurities then is removed leaving product in pure state.

Impurities Prove Valuable

An "impurity" is matter out of place. Many substances are called "impurities" but become valuable products when separated from their "evil companions." Thus a slimy mold growth, until recently considered an impurity, has now become important because one of the "impurities" (Penicillin) is a valuable medicinal when extracted in its pure form.

Purification is accomplished by extracting the mold with active carbon to adsorb only the desired medicinal and reject everything else. To do this it was necessary to develop a new technique and method of application, as active carbon, used in the former conventional way, will take up all impurities.

Research studies reveal that the surface of carbon is covered with a multitude of adsorptive centers. These centers may be likened to tiny hooks that are able to lock up certain molecules from a solution. Many different types of surface locks are present and the familiar thought of a special key for each lock may be applied. Thus, one type of surface lock will hold molecules of carbolic acid, while an adjacent lock may hold alcohol molecules. This knowledge has been of great help in advancing these newer applications and also has resulted in developing new types of active carbons for special tasks.

New assistance is provided by recent studies revealing methods of destroying undesired surface locks. Prolonged grinding or oxidizing chemicals can cause carbons to lose certain undesired powers of attraction. Another method giving promise is to employ types of solvents that block off or blanket undesired surface locks and leave free those that are needed. It is too early to fully assess the value of these new discoveries but they will extend the use of active carbon for preparation of valuable new products and chemicals.

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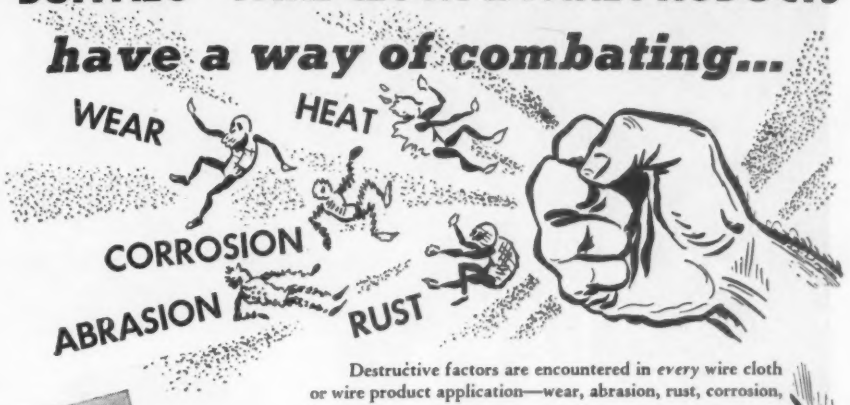

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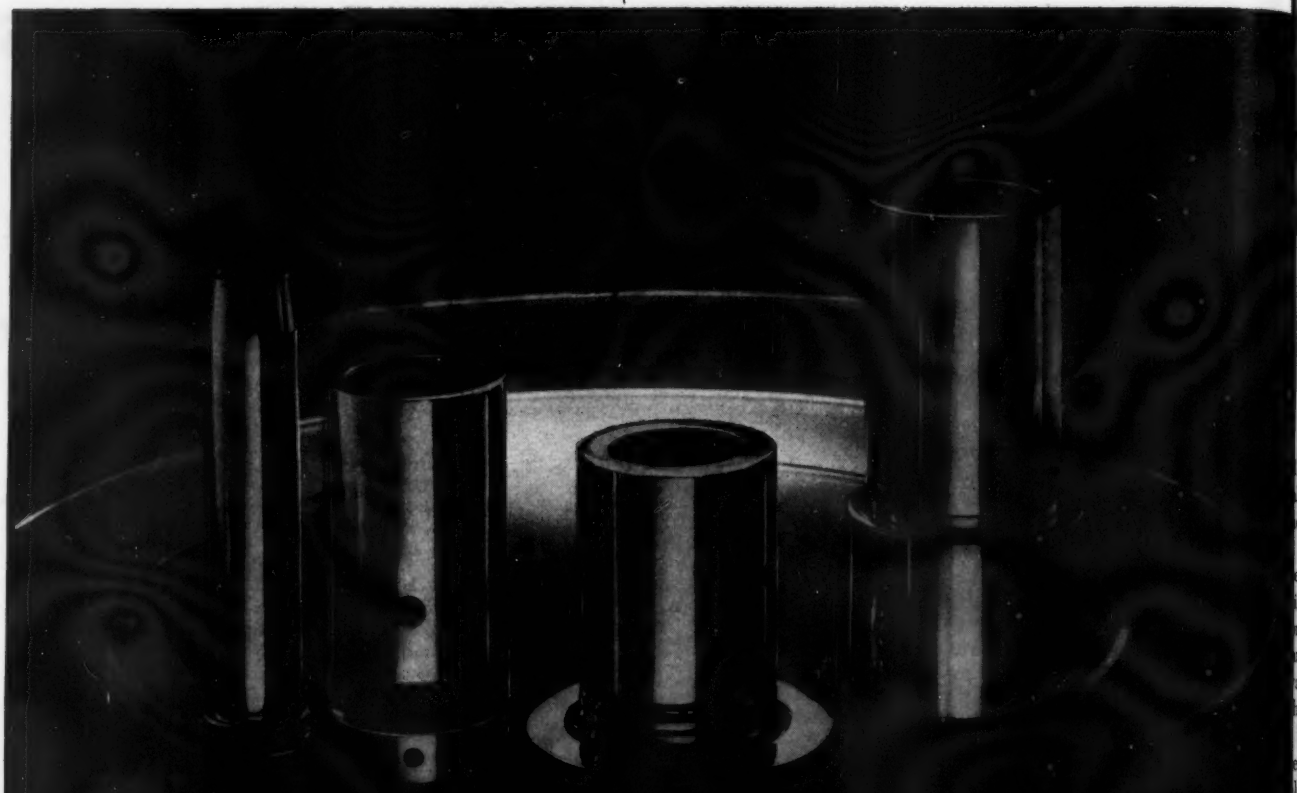

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Cuts in Steel Allotments Reduce Civilian Supply

Second quarter tonnage sharply revised . . . New Navy program developing . . . Coal strike threat feared . . . Raw materials still scarce

REDUCTION of steel allotments for second quarter by about 5 per cent below requests by claimant agencies has affected all consumers in the effort to spread steel production to best advantage.

In the effort to provide as much steel as possible for this reduced program Washington agencies are exerting increasingly rigid control over directives, because of their disruptive effect on mill schedules. Further review of surplus stocks is being undertaken, special instructions having been issued to all shipyards to make every effort to utilize such excess materials as they have.

With 16,900,000 tons allocated for second quarter, civilian requirements have been hardest hit, especially considering their already restricted quotas. Consumer durable goods manufacturers, almost 60 classifications, long since greatly limited, are scheduled to average a further cut of more than 23 per cent. In addition, railroads, oil operators and other large consuming groups have been advised of substantial reductions. Meanwhile, restrictions on the spot reconversion program have been extended for another 90 days.

A new navy program is developing, including aircraft carriers, cruisers and a large number of destroyers. More than 27,000 tons of plates, shapes and bars are being placed for four cruisers to be built by the New York Shipbuilding Co., Camden, N. J., which will also require a substantial tonnage of special steels. A 27,000-ton carrier placed with Philadelphia Navy Yard, will take an estimated 13,000 tons. Other ship contracts are being covered in New England and other yards.

Industry in general, especially the steel industry, awaits with concern results of wage negotiations in the coal mining area, where work stoppage under present conditions being certain to shut down much steel producing capacity almost immediately.

Delivery of practically all steel products is being further delayed and demand continues heavy, some requests being made for contracts running into next year. On material urgently needed for war products directives are the only answer, in spite of the effort to limit further application of this instrument.

Only minor changes in steelmaking operations took place last week and the estimated national rate was unchanged at 96 per cent of capacity. Pittsburgh regained 1½ points to 89½ per cent, Wheeling 1 point to 98½ and Cleveland ½-point to 91. Chicago lost 1 point to 98½ per cent because of a strike and eastern Pennsylvania dropped 1 point as a result of raw material shortage and Detroit lost 3 points to 85. Unchanged rates were as follows: St. Louis 80, Cincinnati 87, Youngstown 92, Buffalo 90½, New England 90 and Birmingham 95.

Resolution of railroad transportation difficulties has improved raw material supply and scrap and pig iron are moving to melters in better volume. Blast furnaces have practically cleared iron piled during the snow blockade. Lack of labor in foundries prevents enlargement of castings output, though demand is greater than production. Orders for second quarter are being booked and promise about the same tonnage as in first quarter. While not seeking additional tonnage contracts steelmakers are accepting all scrap offered, at ceiling prices. Increasing volume of turnings has caused prices to decline in some centers but in others they remain at ceiling.

Office of Price Administration has issued an order allowing warehouses to pass on the recent interim increases in price on several steel products, relieving them of the burden of paying the higher prices and absorbing them. Demand for steel from warehouse is heavy and stocks are being depleted as mill deliveries lag. Consumers finding mill delivery delayed seek prompt steel from store.

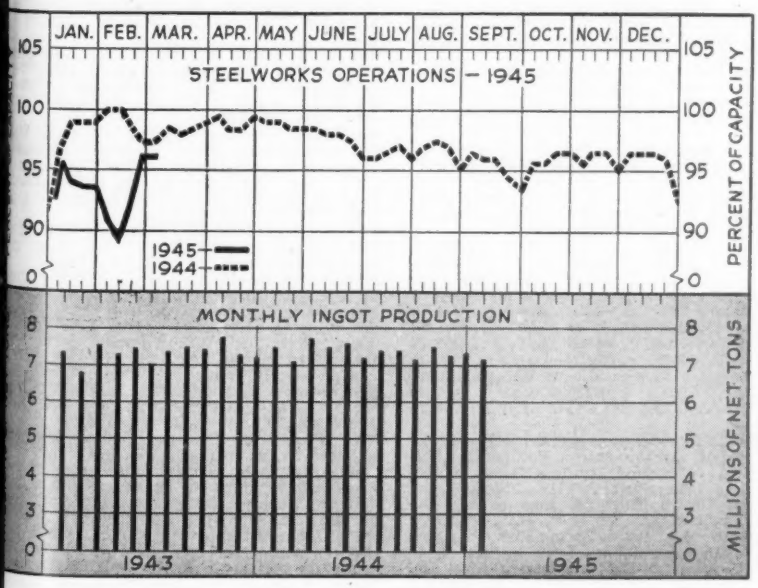
Average composite prices of steel and iron products hold unchanged, at ceilings, finished steel composite being $57.55, semifinished steel $36, steelmaking pig iron $24.05 and steelmaking scrap $19.17.

DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged in Leading Districts

	Week Ended Mar. 3	Change	Same Week 1944	Same Week 1943
Pittsburgh	89.5	+1.5	93	99
Chicago	98.5	—1	101.5	101
Eastern Pa.	90	—1	94	95
Youngstown	92	None	94	97
Wheeling	98.5	+1	99.5	84.5
Cleveland	91	+0.5	92.5	92.5
Buffalo	90.5	None	90.5	93
Birmingham	95	None	95	100
New England	90	None	89	95
Cincinnati	87	None	92	91
St. Louis	80	None	74.5	91
Detroit	85	—3	76	91
Estimated national rate	96	None	*97.5	*99.5

*Based on steelmaking capacities as of these dates.



COMPOSITE MARKET AVERAGES

	Mar. 3	Feb. 24	Feb. 17	One Month Ago Feb., 1945	Three Months Ago Dec., 1944	One Year Ago Mar., 1944	Five Years Ago Mar. 1940
Finished Steel	$57.55	$57.55	$57.55	$57.55	$56.73	$56.73	$56.73
Semifinished Steel	36.00	36.00	36.00	36.00	36.00	36.00	36.00
Steelmaking Pig Iron	24.05	24.05	23.05	23.55	23.05	23.05	22.05
Steelmaking Scrap	19.17	19.17	19.17	19.17	19.17	19.17	16.55

Finished Steel Composite:—Average of industry-wide prices on sheets, strips, bars, plates, shapes, wire nails, tin plate, standard and line pipe. Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania. Finished steel, net tons; others, gross tons.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Mar. 3, 1945	Feb., 1945	Dec., 1944	Mar., 1944
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.15c
Steel bars, Chicago	2.15	2.15	2.15	2.15
Steel bars, Philadelphia	2.47	2.47	2.47	2.47
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.20	2.20	2.10	2.10
Plates, Philadelphia	2.25	2.25	2.15	2.15
Plates, Chicago	2.20	2.20	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.20	2.20	2.10	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Pittsburgh	3.65	3.65	3.50	3.50
Sheets, hot-rolled, Gary	2.20	2.20	2.10	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.05
Sheets, No. 24 galv., Gary	3.65	3.65	3.50	3.50
Bright bess., basic wire, Pittsburgh	2.60	2.60	2.60	2.60
Tin plate, per base box, Pittsburgh	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.80	2.80	2.55	2.55

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods, No. 5 to $\frac{9}{32}$-inch, Pitts	2.00	2.00	2.00	2.00

Pig Iron

	Mar. 3, 1945	Feb., 1945	Dec., 1944	Mar., 1944
Bessemer, del. Pittsburgh	$26.19	$25.69	$25.19	$25.19
Basic, Valley	24.50	24.00	23.50	23.50
Basic, eastern del. Philadelphia	26.34	25.84	25.34	25.34
No. 2 fdry., del. Pitts., N.&S. Sides	25.69	25.19	24.69	24.69
No. 2 foundry, Chicago	25.00	24.50	24.00	24.00
Southern No. 2, Birmingham	21.38	20.88	20.38	20.38
Southern No. 2 del. Cincinnati	25.30	24.80	24.30	24.30
No. 2 fdry., del. Phila.	26.34	26.34	25.84	25.84
Malleable, Valley	25.00	24.50	24.00	24.00
Malleable, Chicago	25.00	24.50	24.00	24.00
Lake Sup., charcoal, del. Chicago	37.34	37.34	37.34	37.34
Gray forge, del. Pittsburgh	25.19	24.69	24.19	24.19
Ferromanganese, del. Pittsburgh	140.33	140.33	140.33	140.33

Scrap

Heavy melting steel, No. 1 Pittsburgh	$20.00	$20.00	$19.75	$20.00
Heavy melt. steel, No. 2, E. Pa.	18.75	18.75	18.75	18.75
Heavy melting steel, Chicago	18.75	18.75	16.70	18.75
Rails for rolling, Chicago	22.25	22.25	22.25	22.25
No. 1 cast, Chicago	20.00	20.00	20.00	20.00

Coke

Connellsville, furnace, ovens	$7.00	$7.00	$7.00	$7.00
Connelisville, foundry ovens	7.75	7.75	7.75	7.75
Chicago, by-product fdry., del.	13.35	13.35	13.35	13.35

STEEL, IRON RAW MATERIAL, FUEL AND METALS PRICES

Following are maximum prices established by OPA Schedule No. 6 issued April 16, 1941, revised June 20, 1941 and Feb. 4, 1942. The schedule covers all iron or steel ingots, all semifinished iron or steel products, all finished hot-rolled, cold-rolled iron or steel products and any iron or steel product which is further finished by galvanizing, plating, coating, drawing, extruding, etc., although only principal established basing points for selected products are named specifically. Seconds and off-grade products are also covered. Exceptions applying to individual companies are noted in the table. Finished steel quoted in cents per pound.

Semifinished Steel

Gross ton basis except wire rods, skelp.

Carbon Steel Ingots: F.o.b. mill base, rerolling qual., stand. analysis, $31.00.

(Empire Sheet & Tin Plate Co., Mansfield, O., may quote carbon steel ingots at $33 gross ton, f.o.b. mill. Kaiser Co. Inc. $43, f.o.b. Pacific ports.)

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon; uncrop., $45.

Rerolling Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $34; Detroit, del. $36; Duluth (bil) $36; Pac. Ports, (bil) $46. (Andrews Steel Co., carbon slabs $41; Continental Steel Corp., billets $34, Kokomo, to Acme Steel Co.; Northwestern Steel & Wire Co., $41, Sterling, Ill.; Laclede Steel Co. $34, Alton or Madison, Ill.; Wheeling Steel Corp. $36 base, billets for lend-lease, $34, Portsmouth, O., on slabs on WPB directives. Granite City Steel Co. $47.50 gross ton slabs from D.P.C. mill. Geneva Steel Co., Kaiser Co. Inc., $58.64, Pac. Ports).

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $40. Detroit, del. $42; Duluth, billets, $42; forg. bll. f.o.b. Pac. Ports, $52.

(Andrews Steel Co. may quote carbon forging billets $50 gross ton at established basing points; Follansbee Steel Corp., $49.50 f.o.b. Toronto, O. Geneva Steel Co., Kaiser Co. Inc., $64.64, Pacific ports.)

Open Hearth Shell Steel: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Youngstown, Birmingham, base 1000 tons one size and section; 3-12 in., $52; 12-18 in., excl., $54.00; 18 in. and over $56. Add $2.00 del. Detroit; $3.00 del. Eastern Mich. (Kaiser Co. Inc., $76.64, f.o.b. Los Angeles.)

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $54; del. Detroit $56, Eastern Mich. $57.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $34. (Wheeling Steel Corp. $37 on lend-lease sheet bars, $38 Portsmouth, O., on WPB directives; Empire Sheet & Tin Plate Co., Mansfield, O., carbon sheet bars, $39, f.o.b. mill.)

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb., 1.90c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, No. 5—$\frac{9}{32}$ in. inclusive, per 100 lbs., $2. Do., over $\frac{9}{32}$—$\frac{47}{64}$-in., incl., $2.15; Galveston, base, 2.25c and 2.40c, respectively. Worcester add $0.10; Pacific Ports $0.50. (Pittsburgh Steel Co., $0.20 higher.)

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3": Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, base 20 tons one size, 2.15c; Duluth, base 2.25c; Mahoning Valley 2.22½c; Detroit, del. 2.25c; Eastern Mich. 2.30c; New York del. 2.49c; Phila. del. 2.47c; Gulf Ports, dock 2.52c; Pac. ports, dock 2.80c. (Calumet Steel Division, Borg Warner Corp., and Joslyn Mfg. & Supply Co. may quote 2.35c, Chicago base; Sheffield Steel Corp., 2.75c, f.o.b. St. Louis.)

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.

(Sweet's Steel Co., Williamsport, Pa., may quote rail steel merchant bars 2.33c f.o.b. mill.)

Hot-Rolled Alloy Bars: Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 2.70c; Detroit, del., 2.80c.

(Texas Steel Co. may use Chicago base price as maximum f.o.b. Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300	$0.10	4100 (.15-.25 Mo)	0.70
		(.20-.30 Mo)	0.75
2300	1.70	4300	1.70
2500	2.55	4600	1.20
3000	0.50	4800	2.15
3100	0.85	5100	0.35
3200	1.35	5130 or 5152	0.45
3400	3.20	6120 or 6152	0.95
4000	0.45-0.55	6145 or 6150	1.20

*Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 20,000-39,999 lbs., 2.65c; Detroit 2.70c; Toledo 2.80c. (Keystone Drawn Steel Co. may sell outside its usual market area on Proc. Div., Treasury Dept. contracts at 2.65c, Spring City, Pa., plus freight on hot-rolled bars from Pittsburgh to Spring City. New England Drawn Steel Co. may sell outside New England on WPB directives at 2.65c, Mansfield, Mass., plus freight on hot-rolled bars from Buffalo to Mansfield.)

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base 3.35c; Detroit, del. 3.45c; Eastern Mich. 3.50c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base 2.15c; Detroit del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c; Pacific ports, dock 2.55c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Buffalo base 2.15c; Detroit, del. 2.25c; Eastern Mich. and Toledo 2.30c; Gulf ports, dock 2.50c.

(Sweet's Steel Co., Williamsport, Pa., may quote rail steel reinforcing bars 2.33c, f.o.b. mill.)

Iron Bars: Single refined, Pitts. 4.40c; double refined 5.40c; Pittsburgh, staybolt, 5.75c; Terre Haute, single ref., 5.00c, double ref., 6.25c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Pt., Middletown, base 2.20c; Granite City, base 2.30c; Detroit del. 2.30c; Eastern Mich. 2.35c; Phila. del. 2.37c; New York del. 2.44c; Pacific ports 2.75c.

(Andrews Steel Co. may quote hot-rolled sheets for shipment to Detroit and the Detroit area or, the Middletown, O. base.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.05c; Granite City, base 3.15c; Detroit del. 3.15c; Eastern Mich. 3.20c; New York del. 3.39c; Phila. del. 3.37c; Pacific ports 3.70c.

Galvanized Sheets, No. 24: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base 3.65c; Granite City, base 3.75c; New York del. 3.88c; Phila. del. 3.82c; Pacific ports 4.20c.

(Andrews Steel Co. may quote galvanized sheets 3.75c at established basing points.)

Corrugated Galv. Sheets: Pittsburgh, Chicago, Gary, Birmingham, 29 gage, per square 3.31

Culvert Sheets: Pittsburgh, Chicago, Gary, Birmingham, 16 gage, not corrugated, copper alloy 3.60c; Granite City 3.70c; Pacific Ports 4.25c; copper iron 3.90c, pure iron 3.95c; zinc coated, hot-dipped, heat-treated, No. 24, Pittsburgh, 4.25c.

Enameling Sheets: 10-gage; Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base, 2.75c; Granite City, base 2.85c; Detroit, del. 2.85c; eastern, Mich. 2.90c; Pacific ports 3.40c; **20-gage;** Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base 3.35c; Detroit del. 3.45c; eastern Mich. 3.50c; Pacific ports 4.00c.

Electrical Sheets No. 24:

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.20c	3.95c	3.30c
Armature	3.55c	4.30c	3.65c
Electrical	4.05c	4.80c	4.15c
Motor	4.95c	5.70c	5.05c
Dynamo	5.65c	6 40c	5.75c
Transformer			
72	6.15c	6.90c	.....
65	7.15c	7.90c	.....
58	7.65c	8.40c	.....
52	8.45c	9.20c	.....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base 1 ton and over, 12 inches wide and less 2.10c; Detroit del. 2.20c; Eastern Mich. 2.25c; Pacific ports 2.75c. (Joslyn Mfg. Co. may quote 2.30c, Chicago base.)

Cold Rolled Strip: Pittsburgh, Cleveland, Youngstown, 0.25 carbon and less 2.80c; Chicago, base 2.90c; Detroit, del. 2.90c; Eastern Mich. 2.95c; Worcester base 3.00c.

Commodity C. R. Strip: Pittsburgh, Cleveland, Youngstown, base 3 tons and over, 2.95c; Chicago 3.05c; Detroit del. 3.05c; Eastern Mich. 3.10c; Worcester base 3.35c.

Cold-Finished Spring Steel: Pittsburgh, Cleveland bases, add 20c for Worcester; .26-.50 Carb., 2.80c; .51-.75 Carb., 4.30c; .76-1.00 Carb., 6.15c; over 1.00 Carb., 8.35c.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb. base box, $5.00; Granite City $5.10.

Electrolytic Tin Plate: Pittsburgh, Gary, 100-lb. base box, 0 50 lb. tin, $4.50; 0.75 lb. tin $4.65.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29 gage and lighter, 3.05c; Granite City, 3.15c; Pacific ports, boxed 4.05c.

Long Ternes: Pittsburgh, Chicago, Gary, No. 24 unassorted 3.80c; Pacific ports 4.55c.

Manufacturing Ternes: (Special Coated) Pittsburgh, Chicago, Gary, 100-base box $4.30; Granite City $4.40.

Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I.C. 8-lb. $12.00; 15-lb. $14.00; 20-lb. $15.00; 25-lb. $16; 30-lb. $17.25; 40-lb. $19.50.

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.20c; New York, del. 2.39c; Phila., del. 2.25c; St. Louis, 2.44c; Boston, del. 2.52-77c; Pacific ports, 2.75c; Gulf ports, 2.55c.

(Granite City Steel Co. may quote carbon plates 2.35c f.o.b. mill; 2.65c f.o.b. D.P.C. mill; Kaiser Co. Inc., 3.20c, f.o.b. Los Angeles. Central Iron & Steel Co. 2.50c f.o.b. basing points; Geneva Steel Co., Provo, Utah, 3.20c, f.o.b. Pac. ports.)

Floor Plates: Pittsburgh, Chicago, 3.35c; Pacific ports, 4.00c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.50c; Gulf ports 3.95c; Pacific ports 4.15c.

Wrought Iron Plates: Pittsburgh, 3.80c.

Shapes

Structural Shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.10c; New York, del. 2.27c; Phila., del. 2.215c; Pacific ports, 2.75c.

(Phoenix Iron Co., Phoenixville, Pa., may quote carbon steel shapes at 2.35c at established basing points and 2.50c, Phoenixville, for export; Sheffield Steel Corp., 2.55c f.o.b. St. Louis, Geneva Steel Co., 3.25c, Pac. ports); Kaiser Co. Inc., 3.20c f.o.b. Los Angeles.)

Steel Sheet Piling: Pittsburgh, Chicago, Buffalo, 2.40c.

Wire Products, Nails

Wire: Pittsburgh, Chicago, Cleveland, Birmingham (except spring wire) to manufacturers in carloads (add $2 for Worcester, $1 for Duluth).

Bright basic, bessemer wire 2.60c
Spring wire 3.20c
(Pittsburgh Steel Co., 0.20c higher.)

Wire Products to the Trade:

Standard and Cement-coated wire nails, and staples, 100-lb. keg, Pittsburgh, Chicago, Birmingham, Cleveland, Duluth $2.80; galvanized, $2.55; Pac. ports ..... $3.30 and $3.05
Annealed fence wire, 100-lb., Pittsburgh, Chicago, Cleveland 3.05c
Galvanized fence wire, 100 lb., Pittsburgh, Chicago, Cleveland 3.40c
Woven fence, 15½ gage and heavier, per base column ..... .67c
Barbed wire, 80-rod spool, Pittsburgh, Chicago, Cleveland, Birmingham, column 70; twisted barbless wire, column 70.

Tubular Goods

Welded Pipe: Base price in carloads, threaded and coupled to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind. 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

Butt Weld

	Steel			Iron	
In.	Blk.	Galv.	In.	Blk.	Galv.
⅛	56	33	½	24	3½
¼ & ⅜	59	40½	¾	30	10
½	63½	51	1-1¼	34	16
¾	66½	55	1½	38	18½
1-3	68½	57½	2	37½	18

Lap Weld

	Steel			Iron	
In.	Blk.	Galv.	In.	Blk.	Galv.
2	61	49½	1¼	23	3½
2½-3	64	52½	1½	28½	10
3½-6	66	54½	2	30½	12
7-8	65	52½	2½, 3½	31½	14½
9-10	64½	52	4	33½	18
11-12	63½	51	4½-8	32½	17
			9-12	28½	12

Boiler Tubes: Net base prices per 100 feet f.o.b. Pittsburgh in carload lots, minimum wall, cut lengths 4 to 24 feet, inclusive.

O.D. Sizes	B.W.G.	—Seamless— Hot Rolled	Cold Drawn	—Lap Weld— Steel	Charcoal Iron
1"	13	$ 7.82	$ 9.01	.....	.....
1¼"	13	9.26	10.67	.....	.....
1½"	13	10.23	11.72	$ 9.72	$23.71
1¾"	13	11.64	13.42	11.06	22.93
2"	13	13.04	15.03	12.38	19.35
2¼"	13	14.54	16.76	13.79	21.63
2½"	12	16.01	18.45	15.16	.....
2¾"	12	17.54	20.21	16.58	26.57
3"	12	18.59	21.42	17.54	29.00
3½"	12	19.50	22.48	18.35	31.38
3½"	11	24.63	28.37	23.15	39.81
4"	10	30.54	35.20	28.66	49.90
4½"	10	37.35	43.04	35.22	.....
5"	9	46.87	54.01	44.25	73.93
6"	7	71.96	82.93	68.14	.....

Rails, Supplies

Standard rails, over 60-lb., f.o.b. mill, gross ton, $43.00. Light rails (billet), Pittsburgh, Chicago, Birmingham, gross ton, $43.00.

*Relaying rails, 35 lbs. and over, f.o.b. railroad and basing points, $31-$33.

Supplies: Track bolts, 4.75c; heat treated, 5.00c. Tie plates, $43 net ton, base, Standard spikes, 3.00c.

*Fixed by OPA Schedule No. 46, Dec. 15, 1941.

Tool Steels

Tool Steels: Pittsburgh, Bethlehem, Syracuse, base, cents per lb.: Reg. carbon 14.00c; extra carbon 18.00c; special carbon 22.00c; oil-hardening 24.00c; high car.-chr. 43.00c.

Tung	Chr.	Van.	Moly.	Pitts. base per lb.
18.00	4	1	...	67.00c
1.5	4	1	8.5	54.00c
.....	4	2	8	54.00c
5.50	4	1.50	4	57.50c
5.50	4.50	4	4.50	70.00c

Stainless Steels

Base, Cents per lb.—f.o.b. Pittsburgh

CHROMIUM NICKEL STEEL

Type	Bars	Plates	Sheets	H. R. Strip	C. R. Strip
302	24.00c	27.00c	34.00c	21.50c	28.00c
303	26.00	29.00	36.00	27.00	33.00
304	25.00	29.00	36.00	23.50	30.00
308	29.00	34.00	41.00	28.50	35.00
309	36.00	40.00	47.00	37.00	47.00
310	49.00	52.00	53.00	48.75	56.00
312	36.00	40.00	49.00	.....	.....
*316	42.00	44.00	48.00	40.00	48.00
†321	29.00	34.00	41.00	29.25	38.00
‡347	33.00	38.00	45.00	33.00	42.00
431	19.00	22.00	25.00	17.50	22.50

STRAIGHT CHROMIUM STEEL

403	21.50	24.50	29.50	21.25	27.00
**410	18.50	21.50	26.50	17.00	22.00
416	19.00	22.00	27.00	18.25	23.50
††420	24.00	28.50	33.50	23.75	36.50
430	19.00	22.00	29.00	17.50	22.50
‡‡430F	19.50	22.50	29.50	18.75	24.50
440A	24.00	28.50	33.50	23.75	36.50
442	22.50	25.50	32.50	24.00	32.00
443	22.50	25.50	32.50	24.00	32.00
446	27.50	30.50	36.50	35.00	52.00
501	8.00	12.00	15.75	12.00	17.00
502	9.00	13.00	16.75	13.00	18.00

STAINLESS CLAD STEEL (20%)

304	.....	§§18.00	19.00	.....	.....

*With 2-3% moly. †With titanium. ‡With columbium. **Plus machining agent. ††High carbon. ‡‡Free machining. §§Includes annealing and pickling.

Basing Point Prices are (1) those announced by U. S. Steel Corp. subsidiaries for first quarter of 1941 or in effect April 16, 1941 at designated basing points or (2) those prices announced or customarily quoted by other producers at the same designated points. Base prices under (2) cannot exceed those under (1) except to the extent prevailing in third quarter of 1940.

Extras mean additions or deductions from base prices in effect April 16, 1941.

Delivered prices applying to Detroit, Eastern Michigan, Gulf and Pacific Coast points are deemed basing points except in the case of the latter two areas when water transportation is not available, in which case nearest basing point price, plus all-rail freight may be charged.

Domestic Ceiling prices are the aggregate of (1) governing basing point price, (2) extras and (3) transportation charges to the point of delivery as customarily computed. **Governing basing point** is basing point nearest the consumer providing the lowest delivered price.

Seconds, maximum prices: flat-rolled rejects 75% of prime prices, wasters 75%, waste-wasters 65% except plates, which take waster prices; tin plate $2.80 per 100 lbs.; terne plate $2.25; semifinished 85% of primes; other grades limited to new material ceilings.

Export ceiling prices may be either the aggregate of (1) governing basing point or emergency basing point (2) export extras (3) export transportation charges provided they are the f.a.s. seaboard quotations of the U. S. Steel Export Co. on April 16, 1941.

Bolts, Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%

Carriage and Machine

½ x 6 and smaller ..... 65½ off
Do., ⅝ and ⅝ x 6-in. and shorter ... 63½ off
Do., ¾ to 1 x 6-in. and shorter ..... 61 off
1⅛ and larger, all lengths ..... 59 off
All diameters, over 6-in. long ..... 59 off
Tire bolts ..... 50 off
Step bolts ..... 56 off
Plow bolts ..... 65 off

Stove Bolts

In packages with nuts separate 71-10 off; with nuts attached 71 off; bulk 80 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Nuts

Semifinished hex	U.S.S.	S.A.E.
⅞-inch and less	62	64
⅞-1-inch	59	60
1⅛-1½-inch	57	58
1⅝ and larger	56	

Hexagon Cap Screws

Upset 1-in., smaller ..... 64 off
Milled 1-in., smaller ..... 60 off

Square Head Set Screws

Upset, 1-in., smaller ..... 71 off
Headless, ¼-in., larger ..... 60 off
No. 10, smaller ..... 70 off

Piling

Pittsburgh, Chicago, Buffalo 2.40c

Rivets, Washers

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

Structural 3.75c
⅞-inch and under ..... 65-5 off
Wrought Washers, Pittsburgh, Chicago, Philadelphia, to jobbers and large nut, bolt manufacturers l.c.l. ... $2.75-3.00 off

Metallurgical Coke

Price Per Net Ton

Beehive Ovens

Connellsville, furnace	*7.00
Connellsville, foundry	7.50- 8.00
Connellsville, prem. fdry.	7.75- 8.10
New River, foundry	8.50- 8.75
Wise county, foundry	7.25- 7.75

By-Product Foundry

Wise county, furnace	6.75- 7.25
Kearney, N. J., ovens	12.65
Chicago, outside delivered	12.60
Chicago, delivered	13.35
Terre Haute, delivered	13.10
Milwaukee, ovens	13.35
New England, delivered	14.25
St. Louis, delivered	†13.35
Birmingham, delivered	10.50
Indianapolis, delivered	13.10
Cincinnati, delivered	12.85
Cleveland, delivered	12.80
Buffalo, delivered	13.00
Detroit, delivered	13.35
Philadelphia, delivered	12.88

*Operators of hand-drawn ovens using trucked coal may charge $7.75, effective Nov. 29, 1943. †13.85 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	15.00c
Toluol, two degree	28.00c
Solvent naphtha	27.00c
Industrial xylol	27.00c

Per lb. f.o.b. works

Phenol (car lots, returnable drums)	12.50c
Do., less than car lots	13.25c
Do., tank cars	11.50c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls., to jobbers	8.00c

Per ton, bulk, f.o.b. port

Sulphate of ammonia	$29.20

WAREHOUSE STEEL PRICES

Base delivered price, cents per pound, for delivery within switching limits, subject to established extras.

	Hot rolled bars	Structural shapes	Plates	Floor plates	Hot rolled sheets (10 gage base)	Hot rolled bands (12 gage and heavier)	Hot rolled hoops (14 gage and lighter)	Galvanized flat sheets (24 gage base)	Cold-rolled sheets (17 gage base)	Cold finished bars	Cold-rolled strip	NE hot bars 8600 series	NE hot bars 9400 series
Boston	4.044[1]	3.912[1]	4.012[1]	5.727[1]	3.874[1]	4.106[1]	5.106[1]	5.374[14]	4.744[14]	4.144[13]	4.715	6.012[23]	6.012[23]
New York	3.853[1]	3.758[1]	3.868[1]	5.574[1]	3.600[1]	3.974[1]	3.974[1]	5.160[12]	4.613[14]	4.103[21]	4.774	.....	.....
Jersey City	3.853[1]	3.747[1]	3.868[1]	5.574[1]	3.600[1]	3.974[1]	3.974[1]	5.160[12]	4.613[14]	4.103[21]	4.774	.....	.....
Philadelphia	3.822[1]	3.666[1]	3.705[1]	5.272[1]	3.618[1]	3.922[1]	4.272[1]	5.168[15]	4.872[25]	4.072[21]	4.772	5.816[23]	5.860[23]
Baltimore	3.802[1]	3.759[1]	3.694[1]	5.252[1]	3.494[1]	3.902[1]	4.252[1]	5.044[1]	4.852[25]	4.052[21]	.....	.....	.....
Washington	3.941[1]	3.930[1]	3.896[1]	5.341[1]	3.696[1]	4.041[1]	4.391[1]	5.346[17]	4.841[20]	4.041[21]	.....	.....	.....
Norfolk, Va.	4.065[1]	4.002[1]	4.071[1]	5.465[1]	3.871[1]	4.165[1]	4.515[1]	5.521[17]	4.965[24]	4.165[21]	.....	.....	.....
Bethlehem, Pa.*	.....	3.45[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Claymont, Del.*	.....	.....	3.55[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Coatesville, Pa.*	.....	.....	3.55[1]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Buffalo (city)	3.35[1]	3.40[1]	3.73[1]	5.26[1]	3.45[1]	3.819[1]	3.819[1]	4.90[15]	4.40[10]	3.75[21]	4.669	5.60[23]	5.75[23]
Buffalo (country)	3.25[1]	3.30[1]	3.40[1]	4.90[1]	3.35[1]	3.81[1]	3.50[1]	4.80[15]	4.30[10]	3.65[21]	4.35	5.60[23]	5.75[23]
Pittsburgh (city)	3.35[1]	3.40[1]	3.50[1]	5.00[1]	3.45[1]	3.60[1]	3.60[1]	4.90[15]	4.40[24]	3.75[21]	.....	.....	.....
Pittsburgh (country)	3.25[1]	3.30[1]	3.40[1]	4.90[1]	3.35[1]	3.50[1]	3.50[1]	4.80[15]	4.30[24]	3.65[21]	.....	.....	.....
Cleveland (city)	3.35[1]	3.588[1]	3.50[1]	5.188[1]	3.45[1]	3.60[1]	3.60[1]	5.027[12]	4.40[24]	3.75[21]	4.45[31]	5.60[23]	5.65[23]
Cleveland (country)	3.25[1]	.....	3.40[1]	.....	3.35[1]	3.50[1]	3.50[1]	.....	4.30[24]	3.65[21]	4.35[21]	.....	.....
Detroit	3.450[1]	3.661[1]	3.709[1]	5.281[1]	3.550[1]	3.700[1]	3.700[1]	5.15[12]	4.500[24]	3.800[21]	4.659	5.93[23]	5.93[23]
Omaha (city, delivered)	4.115[1]	4.165[1]	4.265[1]	5.765[1]	3.965[1]	4.215[1]	4.215[1]	5.758[19]	5.443[24]	4.443[12]	.....	.....	.....
Omaha (country, base)	4.015[1]	4.065[1]	4.165[1]	5.665[1]	3.865[1]	4.115[1]	4.115[1]	5.658[19]	.....	.....	.....	.....	.....
Cincinnati	3.611[1]	6.391[1]	3.761[1]	5.291[1]	3.525[1]	3.675[1]	3.675[1]	4.975[12]	4.475[24]	4.011[21]	4.711	6.10	6.20
Youngstown, O.*	.....	.....	.....	.....	.....	.....	.....	4.55[12]	.....	.....	.....	.....	.....
Middletown, O.*	.....	.....	.....	.....	3.35[1]	3.50[1]	3.50[1]	4.80[16]	.....	.....	.....	.....	.....
Chicago (city)	3.50[1]	3.55[1]	3.65[1]	5.15[1]	3.35[1]	3.60[1]	3.60[1]	5.381[15]	4.20[24]	3.75[21]	4.65	5.75[23]	5.85[23]
Milwaukee	3.637[1]	3.687[1]	3.787[1]	5.287[1]	3.487[1]	3.737[1]	3.737[1]	5.422[15]	4.337[24]	3.887[21]	4.787	5.987[23]	6.087[23]
Indianapolis	3.58[1]	3.63[1]	3.73[1]	5.23[1]	3.618[1]	3.768[1]	3.768[1]	5.068[16]	4.568[24]	3.98[21]	4.78	6.08[23]	6.18[23]
St. Paul	3.76[2]	3.81[2]	3.91[2]	5.41[2]	3.61[2]	3.86[2]	3.86[2]	5.407[15]	4.46[24]	4.361[21]	5.102	6.09[23]	6.19[23]
St. Louis	3.647[1]	3.697[1]	3.797[1]	5.297[1]	3.497[1]	3.747[1]	3.747[1]	5.322[15]	4.347[24]	4.031[21]	4.931	6.131[23]	6.231[23]
Memphis, Tenn.	4.015[5]	4.065[5]	4.165[5]	5.78[5]	4.065[5]	4.215[5]	4.215[5]	5.415[15]	4.78[24]	4.33[21]	.....	.....	.....
Birmingham	3.50[1]	3.55[1]	3.65[1]	5.903[1]	3.55[1]	3.70[1]	3.70[1]	4.90[15]	4.852[24]	4.54	5.215	.....	.....
New Orleans (city)	4.10[4]	3.90[4]	4.00[4]	5.85[4]	4.158[4]	4.20[4]	4.20[4]	5.40[26]	5.079[10]	4.60[21]	5.429	.....	.....
Houston, Tex.	3.75[3]	4.25[3]	4.35[3]	5.50[9]	3.863[3]	4.313[3]	4.313[3]	5.463[15]	4.10[10]	3.65[22]	.....	.....	.....
Los Angeles	4.40[4]	4.65[4]	5.05[4]	7.20[4]	5.10[4]	4.95[4]	6.75[4]	6.15[12]	7.20[6]	5.583[20]	5.613	5.85[23]	5.95[23]
San Francisco	4.15[7]	4.35[7]	4.75[7]	6.35[7]	4.65[7]	4.50[7]	5.75[7]	6.50[15]	7.30[15]	5.333[21]	7.333	8.304[23]	8.404[23]
Portland, Oreg.	4.45[27]	4.45[27]	4.85[27]	6.50[27]	4.75[27]	4.75[27]	6.30[27]	5.90[15]	6.60[15]	5.533[15]	.....	.....	.....
Tacoma	4.35[6]	4.45[6]	4.85[6]	6.50[6]	4.75[6]	4.25[6]	5.45[6]	6.10[15]	7.05[15]	5.783[21]	.....	.....	8.00[23]
Seattle	4.35[6]	4.45[6]	4.85[6]	6.50[6]	4.75[6]	4.25[6]	5.45[6]	6.10[15]	7.60[15]	5.783[21]	.....	.....	8.00[23]

*Basing point cities with quotations representing mill prices, plus warehouse spread.

NOTE—All prices fixed by Office of Price Administration in Amendments Nos. 10 to 18 to Revised Price Schedule No. 49. Deliveries outside above cities computed in accordance with regulations.

BASE QUANTITIES

[1]—400 to 1999 pounds; [2]—400 to 14,999 pounds; [3]—any quantity; [4]—300 to 1999 pounds; [5]—400 to 8999 pounds; [6]—300 to 9999 pounds; [7]—400 to 39,999 pounds; [8]—under 2000 pounds; [9]—under 4000 pounds; [10]—500 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 2249 pounds; [13]—150 to 1499 pounds; [14]—three to 24 bundles; [15]—450 to 1499 pounds; [16]—one bundle to 1499 pounds; [17]—one to nine bundles; [18]—one to six bundles; [19]—100 to 749 pounds; [20]—300 to 1999 pounds; [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 to 39,999 pounds; [24]—400 to 1499 pounds; [25]—1000 to 1999 pounds; [26]—under 25 bundles. Cold-rolled strip, 2000 to 39,999 pounds, base; [27]—300 to 4999 pounds.

Ores

Lake Superior Iron Ore
Gross ton, 51½% (Natural)
Lower Lake Ports

Old range bessemer	$4.75
Mesabi nonbessemer	4.45
High phosphorus	4.35
Mesabi bessemer	4.60
Old range nonbessemer	4.60

Eastern Local Ore
Cents, units, del. E. Pa.

Foundry and basic 56-63% contract	13.00

Foreign Ore
Cents per unit, c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mang.	Nom.
N. African low phos.	Nom.
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% f.o.b. Rio de Janeiro	7.50-8.00

Tungsten Ore

Chinese wolframite, per short ton unit, duty paid	$24.00

Chrome Ore

(Equivalent OPA schedules):
Gross ton f.o.b. cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Ore., or Tacoma, Wash.
(S/S paying for discharging; dry basis; subject to penalties if guarantees are not met.)

Indian and African	
48% 2.8:1	$41.00
48% 3:1	43.50
48% no ratio	31.00
South African (Transvaal)	
44% no ratio	$27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.80
Brazilian—nominal	
44% 2.5:1 lump	33.65
48% 3:1 lump	43.50
Rhodesian	
45% no ratio	28.30
48% no ratio	31.00
48% 3:1 lump	43.50
Domestic (seller's nearest rail)	
48% 3:1	52.80
less $7 freight allowance	

Manganese Ore

Sales prices of Metals Reserve Co., cents per gross ton unit, dry, 48%, at New York, Philadelphia, Baltimore, Norfolk, Mobile and New Orleans, 85.0c; Fontana, Calif., Provo, Utah, and Pueblo, Colo., 91.0c; prices include duty on imported ore and are subject to premiums, penalties and other provisions of amended M.P.R. No. 248, effective as of May 15. Price at basing points which are also points of discharge of imported manganese ore is f.o.b. cars, shipside, at dock most favorable to the buyer.

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

NATIONAL EMERGENCY STEELS (Hot Rolled)

(Extras for alloy content)

Designation	Carbon	Mn.	Si.	Cr.	Ni.	Mo.	Basic open-hearth Bars per 100 lb.	Basic open-hearth Billets per GT	Electric furnace Bars per 100 lb.	Electric furnace Billets per GT
	Chemical Composition Limits, Per Cent									
NE 8612	.10-.15	.70-.90	.20-.35	.40-.60	.40-.70	.15-.25	$0.65	$13.00	$1.15	$23.00
NE 8720	.18-.23	.70-.90	.20-.35	.40-.60	.40-.70	.20-.30	.70	14.00	1.20	24.00
NE 9415	.13-.18	.80-1.10	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.00
NE 9425	.23-.28	.80-1.20	.20-.35	.30-.50	.30-.60	.08-.15	.75	15.00	1.25	25.00
NE 9442	.40-.45	1.00-1.30	.20-.35	.30-.50	.30-.60	.08-.15	.80	16.00	1.30	26.00
NE 9722	.20-.25	.50-.80	.20-.35	.10-.25	.40-.70	.15-.25	.65	13.00	1.15	23.00
NE 9830	.28-.33	.70-.90	.20-.35	.70-.90	.85-1.15	.20-.30	1.30	26.00	1.80	36.00
NE 9912	.10-.15	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.20	24.00	1.55	31.00
NE 9920	.18-.23	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.20	24.00	1.55	31.00

Extras are in addition to a base price of 2.70c, per pound on finished products and $54 per gross ton on semifinished steel major basing points and are in cents per pound and dollars per gross ton. No prices quoted on vanadium alloy.

Pig Iron

Prices (in gross tons) are maximums fixed by OPA Price Schedule No. 10, effective June 10, 1941, amended Feb. 14, 1945. Exceptions indicated in footnotes. Base prices bold face, delivered light face. Federal tax on freight charges, effective Dec. 1, 1942, not included in following prices.

	Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$26.00	$25.50	$27.00	$26.50
Newark, N. J., del.	27.53	27.03	28.53	28.03
Brooklyn, N. Y., del.	28.50	.....	.....	29.00
Birdsboro, Pa., base	26.00	25.50	27.00	26.50
Birmingham, base	†21.38	†20.00	26.00	.....
Baltimore, del.	26.61	.....	.....	.....
Boston, del.	26.12	.....	.....	.....
Chicago, del.	25.22	.....	.....	.....
Cincinnati, del.	25.06	23.68	.....	.....
Cleveland, del.	25.12	24.24	.....	.....
Newark, N. J., del.	27.15	.....	.....	.....
Philadelphia, del.	26.46	25.96	.....	.....
St. Louis, del.	25.12	24.24	.....	.....
Buffalo, base	25.00	24.00	26.00	25.50
Boston, del.	26.50	26.00	27.50	27.00
Rochester, del.	26.53	.....	27.53	27.03
Syracuse, del.	27.08	.....	28.08	27.58
Chicago, base	25.00	24.50	25.50	25.00
Milwaukee, del.	26.10	25.60	26.60	26.10
Muskegon, Mich., del.	28.19	.....	.....	28.19
Cleveland, base	25.00	24.50	25.50	25.00
Akron, Canton, O., del.	26.39	25.89	26.89	26.39
Detroit, base	25.00	24.50	25.50	25.00
Saginaw, Mich., del.	27.31	26.81	27.81	27.31
Duluth, base	25.50	25.00	26.00	25.50
St. Paul, del.	27.63	27.13	28.13	27.63
Erie, Pa., base	25.00	24.50	26.00	25.50
Everett, Mass., base	26.00	25.50	27.00	26.50
Boston, del.	26.50	26.00	27.50	27.00
Granite City, Ill., base	25.00	24.50	25.50	25.00
St. Louis, del.	25.50	25.00	.....	25.50
Hamilton, O., base	25.00	24.50	.....	25.00
Cincinnati, del.	25.44	25.61	.....	26.11
Neville Island, Pa., base	25.00	24.50	25.50	25.00
§Pittsburgh, del. No. & So. sides	25.69	25.19	26.19	25.69
Provo, Utah, base	23.00	22.50	.....	.....
Sharpsville, Pa., base	25.00	24.50	25.50	25.00
Sparrows Point, base	26.00	25.50	.....	.....
Baltimore, del.	26.99	.....	.....	.....
Steelton, Pa., base	.....	25.50	.....	26.50
Swedeland, Pa., base	26.00	25.50	27.00	26.50
Philadelphia, del.	26.84	26.34	.....	27.34
Toledo, O., base	25.00	24.50	25.50	25.00
Youngstown, O., base	25.00	24.50	25.50	25.00
Mansfield, O., del.	26.94	26.44	27.44	26.94

Base grade, silicon 1.75-2.25%; add 50 cents for each additional 0.25% silicon, or portion thereof; deduct 50 cents for silicon below 1.75% on foundry iron. †For phosphorus 0.70% or over deduct 38 cents. §For McKees Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Homestead, McKeesport, Ambridge, Monaca, Aliquippa, .84; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenridge 1.24.

Note: Add 50 cents per ton for each 0.50% manganese or portion thereof over 1.00%.

Nickel differentials: Under 0.50%, no extra; 0.50% to 0.74% incl., $2 per ton; for each additional 0.25% nickel, $1 per ton.

High Silicon, Silvery

5.00-6.50 per cent (base)	$30.50		
6.51-7.00	$31.50	9.01- 9.50	36.50
7.01-7.50	32.50	9.51-10.00	37.50
7.51-8.00	33.50	10.01-10.50	38.50
8.01-8.50	34.50	10.51-11.00	39.50
8.51-9.00	35.50	11.01-11.50	40.50

F.o.b. Jackson county, O., per gross ton, Buffalo base prices are $1.25 higher. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton. (For higher silicon irons a differential over and above the price of base grades is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Charcoal Pig Iron

Northern

Lake Superior Furnace $34.00
Chicago, del. 37.34

Southern

Semi-cold blast, high phos., f.o.b. furnace, Lyles, Tenn. $28.50
Semi-cold blast, low phos., f.o.b. furnace, Lyles, Tenn. 33.00

Gray Forge

Neville Island, Pa. $24.50
Valley base 24.50

Low Phosphorus

Basing points: Birdsboro, Pa., $30.50; Steelton, Pa., and Buffalo, N. Y., $30.50 base; $31.74, del. Philadelphia. Intermediate phos., Central Furnace, Cleveland, $27.50.

Switching Charges: Basing point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differentials: Basing point prices are subject to an additional charge not to exceed 50 cents a ton for each 0.25 silicon in excess of base grade (1.75 to 2.25%).

Phosphorus Differential: Basing point prices are subject to a reduction of 38 cents a ton for phosphorus content of 0.70% and over.

Manganese Differentials: Basing point prices subject to an additional charge not to exceed 50 cents a ton for each 0.50% manganese content in excess of 1.0%.

Ceiling Prices are the aggregate of (1) governing basing point (2) differentials (3) transportation charges from governing basing point to point of delivery as customarily computed. Governing basing point is the one resulting in the lowest delivered price for the consumer.

Exceptions to Ceiling Prices: Struthers Iron & Steel Co. may charge 50 cents a ton in excess of basing point prices for No. 2 Foundry, Basic Bessemer and Malleable. Mystic Iron Works, Everet, Mass., may exceed basing point prices by $2 per ton, effective May 20, 1943. Chester, Pa., furnace of Pittsburgh Coke & Iron Co. may exceed basing point prices by $2.25 per ton, effective July 27, 1942. E. & G. Brooke Co., Birdsboro, Pa., allowed $1 above basing point.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky. $66.55

First Quality

Pa., Ill., Md., Mo., Ky.	52.85
Alabama, Georgia	52.85
New Jersey	57.70
Ohio	46.20

Second Quality

Pa., Ill., Md., Mo., Ky.	47.90
Alabama, Georgia	39.15
New Jersey	50.50
Ohio	37.10

Malleable Bung Brick

All bases 61.65

Silica Brick

Pennsylvania	52.85
Joliet, E. Chicago	60.65
Birmingham, Ala.	52.85

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	31.90
Wire cut	29.90

Magnesite

Domestic dead-burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded magnesite	65.00

Fluorspar

Metallurgical grade, f.o.b. Ill., Ky., net ton, carloads CaF_2 content, 70% or more, $33; 65 but less than 70%, $32; 60 but less than 65% $31; less than 60%, $30. (After Aug. 29 base price any grade $30.)

Ferroalloy Prices

Ferromanganese (standard) 78-82% c.l. gross ton, duty paid, eastern, central and western zones, $135; add $6 for packed c.l., $10 for ton, $13.50 less-ton; f.o.b. cars, New Orleans, $1.70 for each 1%, or fraction contained manganese over 82% or under 78%; delivered Pittsburgh, $140.33.

Ferromanganese (Low and Medium Carbon); per lb. contained manganese; eastern zone, low carbon, bulk, c.l., 23c 2000 lb. to c.l., 23.40c; medium, 14.50c and 15.20c; central, low carbon, bulk, c.l., 23.30c; 2000 lb. to c.l., 24.40c; medium, 14.80c and 16.20c; western, low carbon, bulk, c.l., 24.50c, 2000 lb. to c.l., 25.40c; medium, 15.75c and 17.20c; f.o.b. shipping point, freight allowed.

Spiegeleisen: 19-21% carlots per gross ton, Palmerton, Pa. $36; 16-19%, $35.

Electrolytic Manganese: 99.9% plus, less ton lots, per lb. 37.6 cents.

Chromium Metal: 97% min. chromium, max. .50% carbon, eastern zone, per lb. contained chromium bulk, c.l., 79.50c, 2000 lb. to c.l. 80c; central, 81c and 82.50c; western, 82.25c and 84.75c; f.o.b. shipping point, freight allowed.

Ferrocolumbium: 50-60%, per lb. contained columbium in gross ton lots, contract basis, R.R. freight allowed, eastern zone, $2.25; less-ton lots $2.30. Spot prices 10 cents per lb. higher.

Ferrochrome: High carbon, eastern zone, bulk, c.l., 13c, 2000 lb. to c.l., 13.90c; central, add .40c and .85c; western, add 1c and 1.85c—high nitrogen, high carbon ferrochrome: Add 5c to all high carbon ferrochrome prices; all zones; low carbon eastern, bulk, c.l., max. 0.06% carbon, 23c, 0.10% 22.50c, 0.15% 22c, 0.20% 21.50c, 0.50% 21c, 1.00% 20.50c, 2.00% 19.50c; 2000 lb. to c.l., 0.06% 24c, 0.10% 23.50c, 0.15% 23c, 0.20% 22.50c, 0.50% 22c, 1.00% 21.50c, 2.00% 20.50c; central, add .4c for bulk, c.l. and .65c for 2000 lb. to c.l.; western, add 1c for bulk, c.l. and 1.85c for 2000 lb. to c.l.; carload packed differential .45c; f.o.b. shipping point, freight allowed. Prices per lb. contained Cr high nitrogen, low carbon ferrochrome: Add 2c to low carbon ferrochrome prices; all zones. For higher nitrogen carbon add 2c for each .25% of nitrogen over 0.75%.

Special Foundry ferrochrome: (Chrom. 62-66%, car. approx. 5-7%) Contract, carload, bulk 13.50c, packed 13.95c, ton lots 14.40c, less, 14.90c, eastern, freight allowed, per pound contained chromium; 13.90c, 14.35c, 15.05c and 15.55c central; 14.50c, 14.95c, 16.25c and 16.75c, western; spot up .25c.

S.M. Ferrochrome, high carbon: (Chrom. 60-65%, sil. 4-6%, mang. 4-6% and carbon 4-6%.) Contract, carlot, bulk, 14.00c, packed, 14.45c. ton lots 14.90c, less 15.40c, eastern, freight allowed; 14.40c, 14.85c, 15.55c and 16.05c, central; 15.00c, 15.45c, 16.75c and 17.25c, western; spot up .25c; per pound contained chromium.

S.M. Ferrochrome, low carbon: (Chrom. 62-66%, sil. 4-6%, mang. 4-6% and carbon 1.25% max.) Contract, carlot, bulk, 20.00c, packed 20.45c, ton lots 21.00c, less ton lots 22.00c, eastern, freight allowed, per pound contained chromium; 20.40c, 20.85c, 21.65c and 22.65c, central; 21.00c, 21.45c, 22.85c and 23.85c, western; spot up .25c.

SMZ Alloy: (Silicon 60-65%, Mang. 5-7%, zir. 5-7% and iron approx. 20%) per lb. of alloy contract carlots 11.50c, ton lots 12.00c, less 12.50c, eastern zone, freight allowed; 12.00c. 12.85c and 13.35c central zone; 14.05c, 14.60c and 15.10c, western; spot up .25c.

Silcaz Alloy: (Sil. 35-40%, cal. 9-11%, alum. 6-8%, zir. 3-5%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy contract, carlots 25.00c, ton lots 26.00c, less ton lots 27.00c, eastern, freight allowed; 25.50c, 26.75c and 27.75c, central; 27.50c, 28.90c and 29.90c, western; spot up .25c.

Silvaz Alloy: (Sil. 35-40%, van. 9-11%, alum. 5-7%, zir. 5-7%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy. Contract, carlots 58.00c, ton lots 59.00c, less 60.00c, eastern, freight allowed; 58.50c, 59.75c and 60.75c, central; 60.50c, 61.90c and 62.90c, western; spot up ¼c.

CMSZ Alloy 4: (Chr. 45-49%, mang. 4-6%, sil. 18-21%, zir. 1.25-1.75%, and car. 3.00-4.50%). Contract, carlots, bulk, 11.00c and packed 11.50c; ton lots 12.00c; less 12.50c, eastern, freight allowed; 11.50c and 12.00c, 12.75c, 13.25c, central; 13.50c and 14.00c, 14.75c, 15.25c, western; spot up .25c.

CMSZ Alloy 5: (Chr. 50-56%, mang. 4-6%, sil. 13.50-16.00%, zir. .75-1.25%, car. 3.50-5.00%) per lb. of alloy. Contract, carlots, bulk, 10.75c, packed 11.25c, ton lots 11.75c, less 12.25c, eastern, freight allowed; 11.25c, 11.75c and 12.50c, central; 13.25c and 13.75c, 14.50c and 15.00c, western, spot up .25c.

Ferro-Boron: (Bor. 17.50% min., sil. 1.50% max., alum. 0.50% max. and car. 0.50% Max.) per lb. of alloy contract ton lots, $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Manganese-Boron: (Mang. 75% approx., boron 15-20%, iron 5% max., sil. 1.50% max. and carbon 3% max.), per lb. of alloy. Contract, ton lots, $1.89, less, $2.01, eastern, freight allowed; $1.903 and $2.023 central, $1.935 and $2.055 western, spot up 5c.

Nickel-Boron: (Bor. 15-18%, alum. 1% max., sil. 1.50% max., car. 0.50% max., iron 3% max., nickel, balance), per lb. of alloy. Contract, 5 tons or more, $1.90, 1 ton to 5 tons, $2.00, less than ton $2.10, eastern, freight allowed; $1.9125, $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Chromium-Copper: (Chrom. 8-11%, cu. 88-90%, iron 1% max., sil. 0.50% max.) contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate, to which equivalent of St. Louis rate will be allowed; spot, up 2c.

Vanadium Oxide: (Fused: Vanadium oxide 85-88%, sodium oxide, approx. 10% and calcium oxide approx. 2%, or Red Cake: Vanadium oxide 85% approx., sodium oxide, approx. 9% and water approx.

2.5%) Contract, any quantity, $1.10 eastern, freight allowed, per pound vanadium oxide contained; contract, carlots, $1.105, less carlots, $1.108, central; $1.118 and $1.133, western; spot add 5c to contracts in all cases.

Calcium metal; cast: Contract, ton lots or more $1.80, less, $2.30, eastern zone, freight allowed, per pound of metal; $1.809 and $2.309, Central, $1.849 and $2.349, western; spot up 5c.

Calcium-Manganese-Silicon: (Cal. 16-20%, mang. 14-18% and sil. 53-59%), per lb. of alloy. Contract, carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed; 16.00c, 17.35c and 17.85c, central; 18.05c, 19.10c and 19.60c western; spot up .25c.

Calcium-Silicon: (Cal. 30-35%, sil. 60-65% and iron 3.00% max.), per lb. of alloy. Contract, carlot, lump 13.00c, ton lots 14.50c, less 15.50c, eastern, freight allowed; 13.50c, 15.25c and 16.25c central; 15.55c, 17.40c and 18.40c, western; spot up .25c.

Briquets, Ferromanganese: (Weight approx. 3 lbs. and containing exactly 2 lbs. mang.), per lb. of briquets. Contract, carlots, bulk .0605c, packed .063c, tons .0655c, less .068c, eastern, freight allowed; .063c, .0655c, .0755c and .078c, central; .066c, .0685c, .0855c and .088c, western; spot up .25c.

Briquets: Ferrochrome, containing exactly 2 lb. cr., eastern zone, bulk, c.l., 8.25c per lb. of briquets, 2000 lb. to c.l., 8.75c; central, add .3c for c.l. and .5c for 2000 lb. to c.l.; western, add .70c for c.l., and .2c for 2000 lb. to c.l.; **silicomanganese,** eastern, containing exactly 2 lb. manganese and approx. ½ lb. silicon, bulk, c.l., 5.80c, 2000 lbs. to c.l., 6.30c; central, add .25c for c.l. and 1c for 2000 lb. to c.l.; western, add .5c for c.l., and 2c for 2000 lb. to c.l.; **ferrosilicon,** eastern, approx. 5 lb., containing exactly 2 lb. silicon, or weighing approx. 2½ lb. and containing exactly 1 lb. of silicon, bulk, c.l., 3.35c. 2000 lb. to c.l., 3.80c; central, add 1.50c for c.l., and .40c for 2000 lb. to c.l.; western, add 3.0c for c.l. and .45c for 2000 to c.l.; f.o.b. shipping point, freight allowed.

Ferromolybdenum: 55-75% per lb. contained molybdenum, f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Eastern zone, 90-95%, bulk, c.l., 11.05c, 2000 lb. to c.l., 12.30c; 80-90%, bulk c.l., 8.90c, 2000 lb. to c.l., 9.95c; 75%, bulk, c.l., 8.05c, 2000 lb. to c.l., 9.05c; 50%, bulk c.l., 6.65c and 2000 lb. to c.l., 7.85c; central 90-95%, bulk, c.l., 11.20c, 2000 lb. to c.l., 12.80c; 80-90%, bulk, c.l., 9.05c, 2000 to c.l., 10.45c; 75%, bulk, c.l., 8.20c, 2000 lb. to c.l., 9.65c; 50% bulk, c.l., 7.10c, 2000 lb. to c.l., 9.70c; western, 90-95%, bulk, c.l., 11.65c, 2000 lb. to c.l., 15.60c; 80-90%, bulk, c.l., 9.55c, 2000 lb. to c.l., 13.50c; 75%, bulk, c.l., 8.75c, 2000 to c.l., 13.10c; 50%, bulk, c.l., 7.25c, 2000 to c.l., 8.75c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Silicon Metal: Min. 97% silicon and max. 1% iron, eastern zone, bulk, c.l., 12.90c, 2000 lb. to c.l., 13.45c; central, 13.20c and 13.90c; western, 13.85c and 16.80c; min. 96% silicon and max. 2% iron, eastern, bulk, c.l., 12.50c, 2000 lb. to c.l., 13.10c; central, 12.80c and 13.55c; western, 13.45c and 16.50c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Manganese Metal: (96 to 98% manganese, max. 2% iron), per lb. of metal, eastern zone, bulk, c.l., 36c, 2000 lb. to c.l., 38c, central, 36.25c, and 39c; western, 36.55c and 41.05c; 95 to 97% manganese, max. 2.50% iron, eastern, bulk, c.l., 34c; 2000 c.l., 35c; central, 34.25c and 36c; western, 34.55c and 38.05c; f.o.b. shipping point, freight allowed.

Ferrotungsten: Carlots, per lb. contained tungsten, $1.90.

Tungsten Metal Powder: 98-99% per lb. any quantity $2.55-2.65.

Ferrotitanium: 40-45%, R.R. freight allowed, per lb. contained titanium; ton lots $1.23; less-ton lots $1.25; eastern. Spot up 5 cents per lb.

Ferrotitanium: 20-25%, 0.10 maximum carbon; per lb. contained titanium; ton lots $1.35; less-ton lots $1.40; eastern. Spot 5 cents per lb. higher.

High-Carbon Ferrotitanium: 15-20% contract basis, per gross ton, f.o.b. Niagara Falls, N. Y., freight allowed to destination east of Mississippi River and North of Baltimore and St. Louis, 6-8% carbon $142.50; 3-5% carbon $157.50.

Carbortam: Boron 0.90 to 1.15%, net ton to carload, 8c lb. F.O.B. Suspension Bridge, N. Y., frt. allowed same as high-carbon ferrotitanium.

Bortam: Boron 1.5-1.9%, ton lots 45c lb., less ton lots 50c lb.

Ferrovanadium: 35-55%, contract basis, per lb. contained vanadium, f.o.b. producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Zirconium Alloys: 12-15%, per lb. of alloy, eastern, contract, carlots, bulk, 4.60c, packed 4.80c, ton lots 4.80c, less tons 5c, carloads bulk, per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot ¼c per ton higher.

Zirconium Alloy: 35-40%, Eastern, contract basis, carloads in bulk or package, per lb. of alloy 14.00c; gross ton lots 15.00c; less-ton lots 16.00c. Spot ¼ cent higher.

Alsifer: (Approx. 20% aluminum, 40% silicon, 40% iron) contract basis f.o.b. Niagara Falls, N. Y., per lb. 5.75; ton lots 6.50c. Spot ½ cent higher.

Simanal: (Approx. 20% each Si., Mn., Al.) Contract, frt. all. not over St. Louis rate, per lb. alloy; carlots 8c; ton lots 8.75c; less ton lots 9.25c.

Borosil: 3 to 4% boron, 40 to 45% Si., $6.25 lb. cont. Bo., f.o.b. Philo, O., freight not exceeding St. Louis rate allowed.

OPEN MARKET PRICES, IRON AND STEEL SCRAP

Following prices are quotations developed by editors of STEEL in the various centers. For complete OPA ceiling price schedule refer to page 156 of Sept. 4, 1944, issue of STEEL. Quotations are on gross tons.

PHILADELPHIA:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Bundles	18.75
No. 2 Bundles	18.75
No. 3 Bundles	16.75
Machine Shop Turnings	13.75
Mixed Borings, Turnings	13.75
Shoveling Turnings	15.75
No. 2 Busheling	15.50
Billet, Forge Crops	21.25
Bar Crops, Plate Scrap	21.25
Cast Steel	21.25
Punchings	21.25
Elec. Furnace Bundles	19.75
Heavy Turnings	18.25

Cast Grades

(F.o.b. Shipping Point)

Heavy Breakable Cast	16.50
Charging Box Cast	19.00
Cupola Cast	20.00
Unstripped Motor Blocks	17.50
Malleable	22.00
Chemical Borings	16.51

NEW YORK:

(Dealers' buying prices.)

No. 1 Heavy Melt. Steel	$15.33
No. 2 Heavy Melt. Steel	15.33
No. 2 Hyd. Bundles	15.33
No. 3 Hyd. Bundles	13.33
Chemical Borings	14.33
Machine Turning	10.33
Mixed Borings, Turnings	10.33
No. 1 Cupola	20.00
Charging Box	19.00
Heavy Breakable	16.50
Unstrip Motor Blocks	17.50
Stove Plate	19.00

CLEVELAND:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.50
No. 2 Heavy Melt. Steel	19.50
No. 1 Comp. Bundles	19.50
No. 2 Comp. Bundles	19.50
No. 1 Busheling	19.50
Mach. Shop Turnings	11.50-12.00
Short Shovel Turnings	13.50-14.00
Mixed Borings, Turnings	11.50-12.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	15.50
Billet, Bloom Crops	24.50
Sheet Bar Crops	22.00
Plate Scrap, Punchings	22.00
Elec. Furnace Bundles	20.50

BOSTON:

(F.o.b. shipping points)

No. 1 Heavy Melt. Steel	$14.06*
No. 2 Heavy Melt. Steel	14.06*
No. 1 Bundles	14.06*
No. 2 Bundles	14.06*
No. 1 Busheling	14.06*
Machine Shop Turnings	9.06
Mixed Borings, Turnings	9.06
Short Shovel, Turnings	11.06*
Chemical Borings	13.06*
Low Phos. Clippings	16.56*
No. 1 Cast	20.00
Clean Auto Cast	20.00
Stove Plate	19.00
Heavy Breakable Cast	16.50

*Inland base ceiling; Boston switching district price 99 cents higher.

PITTSBURGH:

(Delivered consumer's plant)

Railroad Heavy Melting	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 2 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
No. 2 Comp. Bundles	20.00
Mach. Shop Turnings	14.00
Short Shovel, Turnings	16.00
Mixed Borings, Turnings	14.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	16.00
Billet, Bloom Crops	25.00
Sheet Bar Crops	22.50
Plate Scrap, Punchings	22.50
Railroad Specialties	24.50
Scrap Rail	21.50
Axles	26.00
Rail 3 ft. and under	23.50
Railroad Malleable	21.00

VALLEY:

(Delivered consumer's plant)

No. 1 R.R. Hvy. Melt.	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
Short Shovel Turnings	13.00
Cast Iron Borings	16.00
Machine Shop Turnings	14.00-15.00
Low Phos. Plate	21.00-22.00

MANSFIELD, O.:

(Delivered consumer's plant)

Machine Shop Turnings	11.00-12.00

BIRMINGHAM:

(Delivered consumer's plant)

Billet, Forge Crops	$22.00
Structural, Plate Scrap	19.00
Scrap Rails, Random	18.50
Rerolling Rails	20.50
Angle, Splice Bars	20.50
Solid Steel Axles	24.00
Cupola Cast	20.00
Stove Plate	19.00
Long Turnings	8.50- 9.00
Cast Iron Borings	8.50- 9.00
Iron Car Wheels	16.50-17.00

CHICAGO:

(Delivered consumer's plant)

No. 1 R.R. Hvy. Melt.	$19.75
No. 1 Heavy Melt. Steel	18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Ind. Bundles	18.75
No. 2 Dlr. Bundles	18.75
No. 3 Galv. Bundles	14.25-14.75
Mix. Borings, Sht. Turn.	8.75- 9.25
Machine Turnings	9.00- 9.50
Short Shovel Turnings	8.75- 9.25
Cast Iron Borings	8.75- 9.25
Scrap Rails	20.25
Cut Rails, 3 feet	22.25
Cut Rails, 18-inch	23.50
Angles, Splice Bars	22.25
Plate Scrap, Punchings	21.25
Railroad Specialties	22.75
No. 1 Cast	20.00
R.R. Malleable	22.00

(Cast grades f.o.b. shipping point, railroad grades f.o.b. tracks)

BUFFALO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.25
No. 2 Heavy Melt. Steel	19.25
No. 1 Bundles	19.25
No. 2 Bundles	19.25
No. 1 Busheling	19.25
Machine Turnings	13.75
Short Shovel, Turnings	16.25
Mixed Borings, Turn.	14.25
Cast Iron Borings	13.25
Low Phos.	21.75

DETROIT:

(Dealers' buying prices)

Heavy Melting Steel	$17.32
No. 1 Busheling	17.32
Hydraulic Bundles	17.32
Flashings	17.32
Machine Turnings	9.00- 9.50
Cast Iron Borings	10.00-10.50
Short Turnings	11.00-11.50
Low Phos Plate	19.82
No. 1 Cast	20.00
Heavy Breakable Cast	13.50-14.00

ST. LOUIS:

(Delivered consumer's plant)

Heavy Melting	$17.50
No. 1 Locomotive Tires	20.00
Misc. Rails	19.00
Railroad Springs	22.00
Bundled Sheets	17.50
Axle Turnings	17.00
Machine Turnings	9.50-10.00
Rerolling Rails	21.00
Steel Car Axles	21.50-22.00
Steel Rails, 3 ft.	21.50
Steel Angle Bars	21.00
Cast Iron Wheels	20.00
No. 1 Machinery Cast	20.00
Railroad Malleable	22.00
Breakable Cast	16.50
Stove Plate	19.00
Grate Bars	15.25
Brake Shoes	15.25

(Cast grades f.o.b. shipping point)

Stove Plate	18.00

CINCINNATI:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.50
No. 2 Heavy Melt. Steel	18.50
No. 1 Comp. Bundles	18.50
No. 2 Comp. Bundles	18.50
Machine Turnings	7.50- 8.00
Shoveling Turnings	9.50-10.00
Cast Iron Borings	9.50-10.00
Mixed Borings, Turnings	8.50- 9.00
No. 1 Cupola Cast	20.00
Breakable Cast	16.50
Low Phosphorus	21.00-21.50
Scrap Rails	20.50-21.00
Stove Plate	16.00-16.50

LOS ANGELES:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$14.00
No. 2 Heavy Melt. Steel	13.00
No. 1, 2 Deal. Bundles	12.00
Machine Turnings	4.50
Mixed Borings, Turnings	4.00
No. 1 Cast	20.00

SAN FRANCISCO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$15.50
No. 2 Heavy Melt. Steel	14.50
No. 1 Busheling	15.50
No. 1, No. 2 Bundles	13.50
No. 3 Bundles	9.00
Machine Turnings	6.90
Billet, Forge Crops	15.50
Bar Crops, Plate	15.50
Cast Steel	15.50
Cut Structural, Plate, 1", under	18.00
Alloy-free Turnings	7.50
Tin Can Bundles	14.50
No. 2 Steel Wheels	16.00
Iron, Steel Axles	23.00
No. 2 Cast Steel	15.00
Uncut Frogs, Switches	16.00
Scrap Rails	16.00
Locomotive Tires	16.00

NONFERROUS METAL PRICES

Copper: Electrolytic or Lake from producers in carlots 12.00c, Del. Conn., less carlots 12.12½c, refinery; dealers may add ¾c for 5000 lbs. to carload; 1000-4999 lbs. 1c; 500-999 1¼c; 0-499 lbs. Casting, 11.75c, refinery for 20,000 lbs., or more, 12.00c less than 20,000 lbs.

Brass Ingot: Carlot prices, including 25 cents per hundred freight allowance; add ¼c for less than 20 tons; 85-5-5-5 (No. 115) 13.00c; 80-10-2 (No. 215) 16.50c; 80-10-10 (No. 305) 16.75c; Navy G (No. 225) 16.75c; Navy M (No. 245) 14.75c; No. 1 yellow (No. 405) 11.00c; manganese bronze (No. 420) 12.75c.

Zinc: Prime western 8.25c, select 8.35c, brass special 8.50c, intermediate 8.75c, E. St. Louis, for carlots. For 20,000 lbs. to carlots add 25c; 10,000-20,000 0.25c; 2000-10,000 0.40c; under 2000 0.50c.

Lead: Common 6.35c, chemical, 6.40c, corroding 6.45c, E. St. Louis for carloads; add 5 points for Chicago, Minneapolis-St. Paul, Milwaukee-Kenosha districts; add 15 points for Cleveland-Akron-Detroit area, New Jersey, New York state, Texas, Pacific Coast, Richmond, Indianapolis-Kokomo; add 20 points for Birmingham, Connecticut, Boston-Worcester-Springfield, New Hampshire, Rhode Island.

Primary Aluminum: 99% plus, ingots 15.00c del. pigs 14.00c del.; metallurgical 94% min. 13.50c del. Base 10,000 lbs. and over; add ½c 5000-9999 lbs.; 1c less than 2000 lbs.

Secondary Aluminum: All grades 12.50c per lb. except as follows: Low-grade piston alloy (No. 122 type) 10.50c; No. 12 foundry alloy (No. 12 grade) 10.50c; chemical warfare service ingot (92½% plus) 10.00c; steel deoxidizers 2 notch bars, granulated or shot, Grade 1 (95-97½%) 11.00c, Grade 2 (92-95%) 9.50c to 10.75c, Grade 3 (90-92%) 8.50c to 8.75c, Grade 4 (85-90%) 7.50c to 8.00c; any other ingot containing over 1% iron, except PM 754 and hardness, 12.00c. Above prices for 30,000 lb. and more; add ¼c 10,000-30,000 lbs.; ½c 1000-9,000 lbs.; 1c less than 1000 lbs. Prices include freight at carload rate up to 75 cents per hundred.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lbs.), 20.50c lb., add 1c for special shapes and sizes. Alloy ingots, incendiary bomb alloy, 23.40c; 50-50 magnesium-aluminum, 23.75c; ASTM B93-41T, Nos. 2, 3, 4, 12, 13, 14, 17, 23.00c; Nos. 4X, 12, 13X, 17X, 25.00c; ASTM B107-41T, or AMS-41T, No. 8X, 23.00c; No. 18, 23.50c; No. 18X, 25.00c. Selected magnesium crystals, powders, and muffs, including all packing screening, barrelling, handling, and other preparation charges, 23.50c. Prices for 100 lb. or more; for 25-100 lbs., add 10c; for less than 25 lbs., 20c. Incendiary bomb alloy, 100 lb. plant, any quantity; carload freight allowed all other alloys for 500 lbs. or more.

Nickel: Prices ex-dock, New York in 5-ton lots, add 1 cent for 2240-11,199 lbs., 1½c 1000-2239, 2c 500-999, 3c under 500. Grade A, 99.8% and higher (includes Straits), 52.00c; Grade B, 99% or higher, not meeting specifications for Grade A, with 0.05 per cent maximum arsenic, 51.87½c; Grade C, 99.65-99.79% incl. 51.75c; Grade D, 99.50-99.64% incl., 51.50c; Grade E, 99-99.49% incl. 51.12½c; Grade F, below 99% (for tin content), 51.00c.

Antimony: American, bulk carlots f.o.b. Laredo, Tex., 99.0% to 99.8% and 99.8% and over but not meeting specifications below, 14.00c; 99.8% and over (arsenic, 0.05%, max. all other impurities, 0.1%, max.) 15.00c. On producers' sales add ¼c for less than carload to 10,000 lb.; ½c for 9999-224-lb.; and 2c for 224 lb. and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.5%, f.o.b. refinery 35.00c lb.; pig and shot produced from electrolytic cathodes 36.00c; "F" nickel shot and ingot for additions to cast iron, 34.00c; Monel shot 28.00c.

Mercury: OPA ceiling prices per 76-lb. flask f.o.b. point of shipment or entry. Domestic produced in Calif., Oreg., Wash., Idaho, Nev., Ariz., $191; produced in Texas, Ark. $193. Foreign, produced in Mexico, duty paid, $193. Open market, spot, New York, nominal for 50 to 100 flasks; $170 to $172 in smaller quantities.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Beryllium-Copper: 3.75-4.25% Be., $17 lb. contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, sticks, slabs, sticks and all other "regular" straight or flat forms 90.00c lb., del.; anodes, balls, discs and all other special or patented shapes 95.00c lb. del.

Cobalt: 97-99%, $1.50 lb. for 550 lb. (bbl.); $1.52 lb. for 100 lb. (case); $1.57 lb. under 100 lb.

Indium: 99.9%, $7.50 per troy ounce.

Gold: U. S. Treasury, $35 per ounce.

Silver: Open market, N. Y. 44.75c per ounce.

Platinum: $35 per ounce.

Iridium: $165 per troy ounce.

Palladium: $24 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 12.00c, Conn., for copper. Freight prepaid on 100 lbs. or more.)

Sheet: Copper 20.87c; yellow brass 19.48c; commercial bronze, 90% 21.07c, 95% 21.28c; red brass, 80% 20.15c, 85% 20.36c; phosphor bronze, Grades A and B 5% 36.25c; Everdur, Herculoy, Duronze or equiv. 26.00c; naval brass 24.50c; manganese bronze 28.00c; Muntz metal 22.75c; nickel silver 5% 26.50c.

Rods: Copper, hot-rolled 17.37c, cold-rolled 18.37c; yellow brass 15.01c; commercial bronze 90% 21.32c, 95% 21.53c; red brass 80% 20.40c, 85% 20.61c; phosphor bronze Grade A, B 5% 36.50c; Everdur, Herculoy, Duronze or equiv. 25.50c; Naval brass 19.12c; manganese bronze 22.50c; Muntz metal 18.87c; nickel silver 5% 26.50c.

Seamless Tubing: Copper 21.37c; yellow brass 22.23c; commercial bronze 90% 23.47c; red brass 80% 22.80c, 85% 23.01c.

Extruded Shapes: Copper 20.87c; architectural bronze 19.12c; manganese bronze 24.00c, Muntz metal 20.12c; Naval brass 20.37c.

Angles and Channels: Yellow brass 27.98c; commercial bronze 90% 29.57c, 95% 29.78c; red brass 80% 28.65c, 85% 28.86c.

Copper Wire: Soft, f.o.b. Eastern mills, carlots 15.37½c, less-carlots 15.87½c; weatherproof, f.o.b. Eastern mills, carlots 17.00c, less-carlots 17.50c; magnet, delivered, carlots 17.50c, 15,000 lbs. or more 17.75c, less carlots 18.25c.

Aluminum Sheets and Circles: 2s and 3s, flat, mill finish, base 30,000 lbs. or more; del.; sheet widths as indicated; circle diameters 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers; full sheets 9.50c; cut sheets 9.75c; pipe 8.15c, New York; 8.25c, Philadelphia, Baltimore, Rochester and Buffalo; 8.75c, Chicago, Cleveland, Worcester, Boston.

Zinc Products: Sheet f.o.b. mill, 13.15c; 36,000 lbs. and over deduct 7%. Ribbon and strip 12.25c, 3000-lb. lots deduct 1%, 6000 lbs. 2% 9000 lbs. 3%, 18,000 lbs. 4%, carloads and over 7%. Boiler plate (not over 12") 3 tons and over 11.00c; 1-3 tons 12.00c; 500-2000 lbs. 12.50c; 100-500 lbs. 13.00c; under 100 lbs. 14.00c. Hull plate (over 12") add 1c to boiler plate prices.

Plating Materials

Chromic Acid: 99.75%, flake, del., carloads 16.25c; 5 tons and over 16.75c; 1-5 tons 17.25c; 400 lbs. to 1 ton 17.75c; under 400 lbs. 18.25c.

Copper Anodes: Base 2000-5000 lbs., del.; oval 17.62c; untrimmed 18.12c; electro-deposited 17.37c.

Copper Carbonate: 52-54% metallic cu, 250 lb. barrels 20.50c.

Copper Cyanide: 70-71% cu, 100-lb. kegs or bbls. 34.00c f.o.b. Niagara Falls.

Sodium Cyanide: 96%, 200-lb. drums 15.00c; 10,000-lb. lots 13.00c f.o.b. Niagara Falls.

Nickel Anodes: 500-2999 lb. lots; cast and rolled carbonized 47.00c; rolled, depolarized 48.00c.

Nickel Chloride: 100-lb. kegs or 275-lb. bbls. 18.00c lb., del.

Tin Anodes: 1000 lbs. and over 58.50c, del.; 500-999 59.00c; 200-499 59.50c; 100-199 61.00c.

Tin Crystals: 400 lb. bbls. 39.00c f.o.b. Grasselli, N. J.; 100-lb. kegs 39.50c.

Sodium Stannate: 100 or 300-lb. drums 36.50c, del.; ton lots 33.50c.

Zinc Cyanide: 100-lb. kegs or bbls. 33.00c, f.o.b. Niagara Falls.

Scrap Metals

Brass Mill Allowances: Prices for less than 15,000 lbs. f.o.b. shipping point. Add ¾c for 15,000-40,000 lbs.; 1c for 40,000 lbs. or more.

	Clean Heavy	Rod Ends	Clean Turnings
Copper	10.250	10.250	9.500
Tinned Copper	9.625	9.625	9.375
Yellow Brass	8.625	8.375	7.875
Commercial bronze			
90%	9.375	9.125	8.625
95%	9.500	9.250	8.750
Red Brass, 85%	9.125	8.875	8.375
Red Brass, 80%	9.125	8.875	8.375
Muntz metal	8.000	7.750	7.250
Nickel Sil., 5%	9.250	9.000	4.625
Phos. br., A, B, 5%	11.000	10.750	9.750
Herculoy, Everdur or equivalent	10.250	10.000	9.250
Naval brass	8.250	8.000	7.500
Mang. bronze	8.250	3.000	7.500

Other than Brass Mill Scrap: Prices apply on material not meeting brass mill specifications and are f.o.b. shipping point; add ¾c for shipment of 60,000 lbs. of one group and ½c for 20,000 lbs. of second group shipped in same car. Typical prices follow:

(Group 1) No. 1 heavy copper and wire, No. 1 tinned copper, copper borings 9.75c; No. 2 copper wire and mixed heavy copper, copper tuyeres 8.75c.

(Group 2) soft red brass and borings, aluminum bronze 9.00c; copper-nickel and borings 9.25c; car boxes, cocks and faucets 7.75c; bell metal 15.50c; babbit-lined brass bushings 13.00c.

(Group 3) zincy bronze borings, Admiralty condenser tubes, brass pipe 7.50c; Muntz metal condenser tubes 7.00c; yellow brass 6.25c; manganese bronze (lead 0.00%-0.40%) 7.25c, (lead 0.41%-1.0%) 6.25c; manganese bronze borings (lead 0.00-0.40%) 6.50c, (lead 0.41-1.00%) 5.50c.

Aluminum Scrap: Prices f.o.b. point of shipment, respectively for lots of less than 1000 lbs.; 1000-20,000 lbs. and 20,000 lbs. or more, plant scrap only. Segregated solids: S-type alloys (2S, 3S, 17S, 18S, 24S, 32S, 52S) 9.00c, 10.00c, 10.50c; All other high grade alloys 8.50c, 9.50c, 10.00c; low grade alloys 8.00c, 9.00c, 9.50c. Segregated borings and turnings: Wrought alloys (17S, 18S, 32S, 52S) 7.50c, 8.50c, 9.00c; all other high grade alloys 7.00c, 8.00c, 8.50c; low grade alloys 6.50c, 7.50c, 8.00c. Mixed plant scrap, all solids, 7.50c, 8.50c, 9.00c; borings and turnings 5.50c, 6.50c, 7.00c.

Lead Scrap: Prices f.o.b. point of shipment. For soft and hard lead, including cable lead, deduct 0.55c from basing point prices for refined metal.

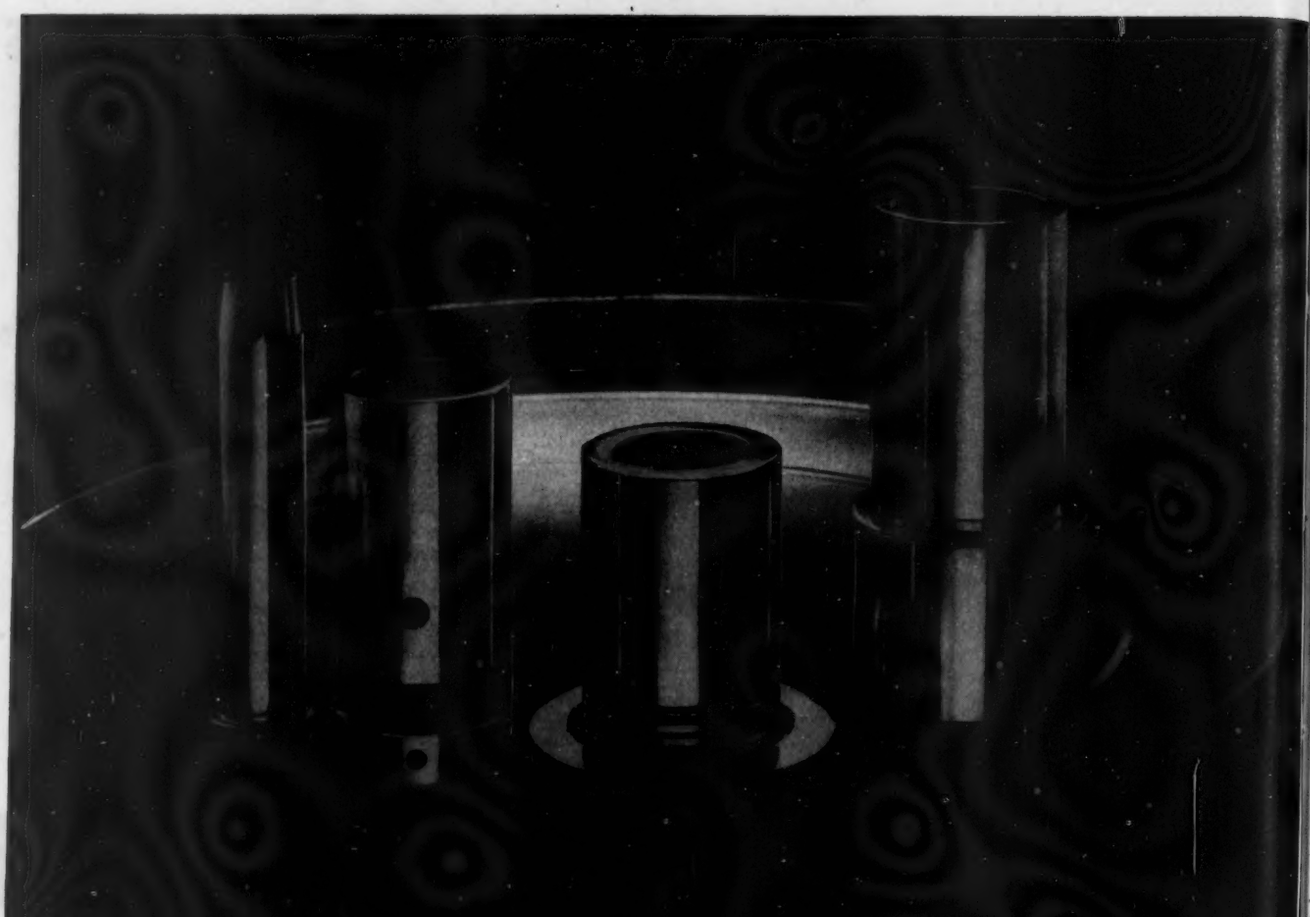
Zinc Scrap: New clippings, old zinc 7.25c f.o.b. point of shipment; add ½-cent for 10,000 lbs. or more; New die-cast scrap, radiator grilles 4.95c, add ½c 20,000 or more. Unsweated zinc dross, die cast slab 5.80c any quantity.

Nickel, Monel Scrap: Prices f.o.b. point of shipment; add ½c for 2000 lbs. or more of nickel or cupro-nickel shipped at one time and 20,000 lbs. or more of Monel. Converters (dealers) allowed 2c premium.

Nickel: 98% or more nickel and not over ½% copper 26.00c; 90-98% nickel, 26.00c per lb. nickel contained.

Cupro-nickel: 90% or more combined nickel and copper 26.00c per lb. contained nickel, plus 8.00c per lb. contained copper; less than 90% combined nickel and copper 26.00c for contained nickel only.

Monel: No. 1 castings, turnings 15.00c; new clipping 20.00c; soldered sheet 18.00c.



Bunting today produces Cast Bronze Bearings of superlative quality... In precision, in fineness of finish, in uniform physical and metallurgical qualities they surpass any Cast Bronze Bearings ever before produced in volume... Developed for war they are fit for the finest machines of peace. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Warehouses in principal cities.

Bunting

BRONZE BEARINGS ★ BUSHINGS ★ PRECISION BRONZE BARS

Pig Iron

Prices (in gross tons) are maximums fixed by OPA Price Schedule No. 10, effective June 10, 1941, amended Feb. 14, 1945. Exceptions indicated in footnotes. Base prices bold face, delivered light face. Federal tax on freight charges, effective Dec. 1, 1942, not included in following prices.

	Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$26.00	$25.50	$27.00	$26.50
Newark, N. J., del.	27.53	27.03	28.53	28.03
Brooklyn, N. Y., del.	28.50	.....	.....	29.00
Birdsboro, Pa., base	26.00	25.50	27.00	26.50
Birmingham, base	†21.38	†20.00	26.00	.....
Baltimore, del.	26.61	.....	.....	.....
Boston, del.	26.12	.....	.....	.....
Chicago, del.	25.22	.....	.....	.....
Cincinnati, del.	25.06	23.68	.....	.....
Cleveland, del.	25.12	24.24	.....	.....
Newark, N. J., del.	27.15	.....	.....	.....
Philadelphia, del.	26.46	25.96	.....	.....
St. Louis, del.	25.12	24.24	.....	.....
Buffalo, base	25.00	24.00	26.00	25.50
Boston, del.	26.50	26.00	27.50	27.00
Rochester, del.	26.53	.....	27.53	27.03
Syracuse, del.	27.08	.....	28.08	27.58
Chicago, base	25.00	24.50	25.50	25.00
Milwaukee, del.	26.10	25.60	26.60	26.10
Muskegon, Mich., del.	28.19	.....	.....	28.19
Cleveland, base	25.00	24.50	25.50	25.00
Akron, Canton, O., del.	26.39	25.89	26.89	26.39
Detroit, base	25.00	24.50	25.50	25.00
Saginaw, Mich., del.	27.31	26.81	27.81	27.31
Duluth, base	25.50	25.00	26.00	25.50
St. Paul, del.	27.63	27.13	28.13	27.63
Erie, Pa., base	25.00	24.50	26.00	25.50
Everett, Mass., base	26.00	25.50	27.00	26.50
Boston, del.	26.50	26.00	27.50	27.00
Granite City, Ill., base	25.00	24.50	25.50	25.00
St. Louis, del.	25.50	25.00	.....	25.50
Hamilton, O., base	25.00	24.50	.....	25.00
Cincinnati, del.	25.44	25.61	.....	26.11
Neville Island, Pa., base	25.00	24.50	25.50	25.00
‡Pittsburgh, del. No. & So. sides	25.69	25.19	26.19	25.69
Provo, Utah, base	23.00	22.50	.....	.....
Sharpsville, Pa., base	25.00	24.50	25.50	25.00
Sparrows Point, base	26.00	25.50	.....	.....
Baltimore, del.	26.99	.....	.....	.....
Steelton, Pa., base	.....	25.50	.....	26.50
Swedeland, Pa., base	26.00	25.50	27.00	26.50
Philadelphia, del.	26.84	26.34	.....	27.34
Toledo, O., base	25.00	24.50	25.50	25.00
Youngstown, O., base	25.00	24.50	25.50	25.00
Mansfield, O., del.	26.94	26.44	27.44	26.94

Base grade, silicon 1.75-2.25%; add 50 cents for each additional 0.25% silicon, or portion thereof; deduct 50 cents for silicon below 1.75% on foundry iron. †For phosphorus 0.70% or over deduct 38 cents. ‡For McKees Rocks, Pa., add .55 to Neville Island base; Lawrenceville, Homestead, McKeesport, Ambridge, Monaca, Aliquippa, .84; Monessen, Monongahela City .97 (water); Oakmont, Verona 1.11; Brackenridge 1.24.

Note: Add 50 cents per ton for each 0.50% manganese or portion thereof over 1.00%.

Nickel differentials: Under 0.50%, no extra; 0.50% to 0.74% incl., $2 per ton; for each additional 0.25% nickel, $1 per ton.

High Silicon, Silvery

5.00-6.50 per cent (base).....$30.50

6.51-7.00	$31.50	9.01- 9.50	36.50
7.01-7.50	32.50	9.51-10.00	37.50
7.51-8.00	33.50	10.01-10.50	38.50
8.01-8.50	34.50	10.51-11.00	39.50
8.51-9.00	35.50	11.01-11.50	40.50

F.o.b. Jackson county, O., per gross ton, Buffalo base prices are $1.25 higher. Prices subject to additional charge of 50 cents a ton for each 0.50% manganese in excess of 1.00%.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton. (For higher silicon irons a differential over and above the price of base grades is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Charcoal Pig Iron

Northern

Lake Superior Furnace $34.00
Chicago, del. 37.34

Southern

Semi-cold blast, high phos., f.o.b. furnace, Lyles, Tenn. $28.50
Semi-cold blast, low phos., f.o.b. furnace, Lyles, Tenn. 33.00

Gray Forge

Neville Island, Pa. $24.50
Valley base 24.50

Low Phosphorus

Basing points: Birdsboro, Pa., $30.50; Steelton, Pa., and Buffalo, N. Y., $30.50 base; $31.74, del., Philadelphia. Intermediate phos., Central Furnace, Cleveland, $27.50.

Switching Charges: Basing point prices are subject to an additional charge for delivery within the switching limits of the respective districts.

Silicon Differentials: Basing point prices are subject to an additional charge not to exceed 50 cents a ton for each 0.25 silicon in excess of base grade (1.75 to 2.25%).

Phosphorus Differential: Basing point prices are subject to a reduction of 38 cents a ton for phosphorus content of 0.70% and over.

Manganese Differentials: Basing point prices subject to an additional charge not to exceed 50 cents a ton for each 0.50% manganese content in excess of 1.0%.

Ceiling Prices are the aggregate of (1) governing basing point (2) differentials (3) transportation charges from governing basing point to point of delivery as customarily computed. Governing basing point is the one resulting in the lowest delivered price for the consumer.

Exceptions to Ceiling Prices: Struthers Iron & Steel Co. may charge 50 cents a ton in excess of basing point prices for No. 2 Foundry, Basic Bessemer and Malleable. Mystic Iron Works, Everet, Mass., may exceed basing point prices by $2 per ton, effective May 20, 1943. Chester, Pa., furnace of Pittsburgh Coke & Iron Co. may exceed basing point prices by $2.25 per ton, effective July 27, 1942. E. & G. Brooke Co., Birdsboro, Pa., allowed $1 above basing point.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky. $66.55

First Quality

Pa., Ill., Md., Mo., Ky.	52.85
Alabama, Georgia	52.85
New Jersey	57.70
Ohio	46.35

Second Quality

Pa., Ill., Md., Mo., Ky.	47.90
Alabama, Georgia	39.15
New Jersey	50.50
Ohio	37.10

Malleable Bung Brick

All bases 61.65

Silica Brick

Pennsylvania	52.85
Joliet, E. Chicago	60.65
Birmingham, Ala.	52.85

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	31.95
Wire cut	29.90

Magnesite

Domestic dead-burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded magnesite	65.00

Fluorspar

Metallurgical grade, f.o.b. Ill., Ky., net ton, carloads CaF_2 content, 70% or more, $33; 65 but less than 70%, $32; 60 but less than 65% $31; less than 60%, $30. (After Aug. 29 base price any grade $30.)

Ferroalloy Prices

Ferromanganese (standard) 78-82% c.l. gross ton, duty paid, eastern, central and western zones, $135; add $6 for packed c.l., $10 for ton, $13.50 less-ton; f.o.b. cars, New Orleans, $1.70 for each 1%, or fraction contained manganese over 82% or under 78%; delivered Pittsburgh, $140.33.

Ferromanganese (Low and Medium Carbon); per lb. contained manganese; eastern zone, low carbon, bulk, c.l., 23c 2000 lb. to c.l., 23.40c; medium, 14.50c and 15.20c; central, low carbon, bulk, c.l., 23.30c; 2000 lb. to c.l., 24.40c; medium, 14.80c and 16.20c; western, low carbon, bulk, c.l., 24.50c, 2000 lb. to c.l., 25.40c; medium, 15.75c and 17.20c; f.o.b. shipping point, freight allowed.

Spiegeleisen: 19-21% carlots per gross ton, Palmerton, Pa. $36; 16-19%, $35.

Electrolytic Manganese: 99.9% plus, less ton lots, per lb. 37.6 cents.

Chromium Metal: 97% min. chromium, max. .50% carbon, eastern zone, per lb. contained chromium bulk, c.l., 79.50c, 2000 lb. to c.l. 80c; central, 81c and 82.50c; western, 82.25c and 84.75c; f.o.b. shipping point, freight allowed.

Ferrocolumbium: 50-60%, per lb. contained columbium in gross ton lots, contract basis, R.R. freight allowed, eastern zone, $2.25; less-ton lots $2.30. Spot prices 10 cents per lb. higher.

Ferrochrome: High carbon, eastern zone, bulk, c.l., 13c, 2000 lb. to c.l., 13.90c; central, add .40c and .65c; western, add 1c and 1.85c—high nitrogen, high carbon ferrochrome: Add 5c to all high carbon ferrochrome prices; **all zones; low carbon** eastern, bulk, c.l., max. 0.06% carbon, 23c, 0.10% 22.50c, 0.15% 22c, 0.20% 21.50c, 0.50% 21c, 1.00% 20.50c, 2.00% 19.50c; 2000 lb. to c.l., 0.06% 24c, 0.10% 23.50c, 0.15% 23c, 0.20% 22.50c, 0.50% 22c, 1.00% 21.50c, 2.00% 20.50c; central, add .4c for bulk, c.l. and .65c for 2000 lb. to c.l.; western, add 1c for bulk, c.l. and 1.85c for 2000 lb. to c.l.; carload packed differential .45c; f.o.b. shipping point, freight allowed. Prices per lb. contained Cr high nitrogen, low carbon ferrochrome: Add 2c to low carbon ferrochrome prices; all zones. For higher nitrogen carbon add 2c for each .25% of nitrogen over 0.75%.

Special Foundry ferrochrome: (Chrom. 62-66%, car. approx. 5-7%) Contract, carload, bulk 13.50c, packed 13.95c, ton lots 14.40c, less, 14.90c, eastern, freight allowed, per pound contained chromium; 13.90c, 14.35c, 15.05c and 15.55c central; 14.50c, 14.95c, 16.25c and 16.75c, western; spot up .25c.

S.M. Ferrochrome, high carbon: (Chrom. 60-65%, sil. 4-6%, mang. 4-6% and carbon 4-6%.) Contract, carlot, bulk, 14.00c, packed, 14.45c. ton lots 14.90c, less 15.40c, eastern, freight allowed; 14.40c, 14.85c, 15.55c and 16.05c, central; 15.00c, 15.45c, 16.75c and 17.25c, western; spot up .25c; per pound contained chromium.

S.M. Ferrochrome, low carbon: (Chrom. 62-66%, sil. 4-6%, mang. 4-6% and carbon 1.25% max.) Contract, carlot, bulk, 20.00c, packed 20.45c, ton lots 21.00c, less ton lots 22.00c, eastern, freight allowed, per pound contained chromium; 20.40c, 20.85c, 21.65c and 22.65c, central; 21.00c, 21.45c, 22.85c and 23.85c, western; spot up .25c.

SMZ Alloy: (Silicon 60-65%, Mang. 5-7%, zir. 5-7% and iron approx. 20%) per lb. of alloy contract carlots 11.50c, ton lots 12.00c, less 12.50c, eastern zone, freight allowed; 12.00c. 12.85c and 13.35c central zone; 14.05c, 14.60c and 15.10c, western; spot up .25c.

Silcaz Alloy: (Sil. 35-40%, cal. 9-11%, alum. 6-8%, zir. 3-5%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy contract, carlots 25.00c, ton lots 26.00c, less ton lots 27.00c, eastern, freight allowed; 25.50c, 26.75c and 27.75c, central; 27.50c, 28.90c and 29.90c, western; spot up .25c.

Silvaz Alloy: (Sil. 35-40%, van. 9-11%, alum. 5-7%, zir. 5-7%, tit. 9-11% and boron 0.55-0.75%), per lb. of alloy. Contract, carlots 58.00c, ton lots 59.00c, less 60.00c, eastern, freight allowed; 58.50c, 59.75c and 60.75c, central; 60.50c, 61.90c and 62.90c, western; spot up ¼c.

CMSZ Alloy 4: (Chr. 45-49%, mang. 4-6%, sil. 18-21%, zir. 1.25-1.75%, and car. 3.00-4.50%). Contract, carlots, bulk, 11.00c and packed 11.50c; ton lots 12.00c; less 12.50c, eastern, freight allowed; 11.50c and 12.00c, 12.75c, 13.25c, central; 13.50c and 14.00c, 14.75c, 15.25c, western; spot up .25c.

CMSZ Alloy 5: (Chr. 50-56%, mang. 4-6%, sil. 13.50-16.00%, zir. .75-1.25%, car. 3.50-5.00%) per lb. of alloy. Contract, carlots, bulk, 10.75c, packed 11.25c, ton lots 11.75c, less 12.25c, eastern, freight allowed; 11.25c, 11.75c and 12.50c, central; 13.25c and 13.75c, 14.50c and 15.00c, western, spot up .25c.

Ferro-Boron: (Bor. 17.50% min., sil. 1.50% max., alum. 0.50% max. and car. 0.50% Max.) per lb. of alloy contract ton lots, $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Manganese-Boron: (Mang. 75% approx., boron 15-20%, iron 5% max., sil. 1.50% max. and carbon 3% max.), per lb. of alloy. Contract, ton lots, $1.89, less, $2.01, eastern, freight allowed; $1.903 and $2.023 central, $1.935 and $2.055 western, spot up 5c.

Nickel-Boron: (Bor. 15-18%, alum. 1% max., sil. 1.50% max., car. 0.50% max., iron 3% max., nickel, balance), per lb. of alloy. Contract, 5 tons or more, $1.90, 1 ton to 5 tons, $2.00, less than ton $2.10, eastern, freight allowed; $1.9125, $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Chromium-Copper: (Chrom. 8-11%, cu. 88-90%, iron 1% max., sil. 0.50% max.) contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate, to which equivalent of St. Louis rate will be allowed; spot, up 2c.

Vanadium Oxide: (Fused: Vanadium oxide 85-88%, sodium oxide, approx. 10% and calcium oxide approx. 2%, or Red Cake: Vanadium oxide 85% approx., sodium oxide, approx. 9% and water approx.

2.5%) Contract, any quantity, $1.10 eastern, freight allowed, per pound vanadium oxide contained; contract, carlots, $1.105, less carlots, $1.108, central; $1.118 and $1.133, western; spot add 5c to contracts in all cases.

Calcium metal; cast: Contract, ton lots or more $1.80, less, $2.30, eastern zone, freight allowed, per pound of metal; $1.809 and $2.309, Central, $1.849 and $2.349, western; spot up 5c.

Calcium-Manganese-Silicon: (Cal. 16-20%, mang. 14-18% and sil. 53-59%), per lb. of alloy. Contract, carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed; 16.00c, 17.35c and 17.85c, central; 18.05c, 19.10c and 19.60c western; spot up .25c.

Calcium-Silicon: (Cal. 30-35%, sil. 60-65% and iron 3.00% max.), per lb. of alloy. Contract, carlot, lump 13.00c, ton lots 14.50c, less 15.50c, eastern, freight allowed; 13.50c, 15.25c and 16.25c central; 15.55c, 17.40c and 18.40c, western; spot up .25c.

Briquets, Ferromanganese: (Weight approx. 3 lbs. and containing exactly 2 lbs. mang.), per lb. of briquets. Contract, carlots, bulk .0605c, packed .063c, tons .0655c, less .068c, eastern, freight allowed; .063c, .0655c, .0755c and .078c, central; .066c, .0685c, .0855c and .088c, western; spot up .25c.

Briquets: Ferrochrome, containing exactly 2 lb. cr., eastern zone, bulk, c.l., 8 25c per lb. of briquets, 2000 lb. to c.l., 8.75c; central, add .3c for c.l. and .5c for 2000 lb. to c.l.; western, add .70c for c.l., and .2c for 2000 lb. to c.l.; **silicomanganese,** eastern, containing exactly 2 lb. manganese and approx. ½ lb. silicon, bulk, c.l., 5.80c, 2000 lbs. to c.l., 6.30c; central, add .25c for c.l. and 1c for 2000 lb. to c.l.; western, add .5c for c.l., and 2c for 2000 lb. to c.l.; **ferrosilicon,** eastern, approx. 5 lb., containing exactly 2 lb. silicon, or weighing approx. 2½ lb. and containing exactly 1 lb. of silicon, bulk, c.l., 3.35c, 2000 lb. to c.l., 3.80c; central, add 1.50c for c.l., and .40c for 2000 lb. to c.l.; western, add 3.0c for c.l. and .45c for 2000 to c.l.; f.o.b. shipping point, freight allowed.

Ferromolybdenum: 55-75% per lb. contained molybdenum, f.o.b. Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% phosphorus content, with unitage of $3 for each 1% of phosphorus above or below the base; gross tons per carload f.o.b. sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Eastern zone, 90-95%, bulk, c.l., 11.05c, 2000 lb. to c.l., 12.30c; 80-90%, bulk c.l., 8.90c, 2000 lb. to c.l., 9.95c; 75%, bulk, c.l., 8.05c, 2000 lb. to c.l., 9.05c; 50%, bulk c.l., 6.65c and 2000 lb. to c.l., 7.85c; central 90-95%, bulk, c.l., 11.20c, 2000 lb. to c.l., 12.80c; 80-90%, bulk, c.l., 9.05c, 2000 to c.l., 10.45c; 75%, bulk, c.l., 8.20c, 2000 lb. to c.l., 9.65c; 50% bulk, c.l., 7.10c, 2000 lb. to c.l., 9.70c; western, 90-95%, bulk, c.l., 11.65c, 2000 lb. to c.l., 15.60c; 80-90%, bulk, c.l., 9.55c, 2000 lb. to c.l., 13.50c; 75%, bulk, c.l., 8.75c, 2000 to c.l., 13.10c; 50%, bulk, c.l., 7.25c, 2000 to c.l., 8.75c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Silicon Metal: Min. 97% silicon and max. 1% iron, eastern zone, bulk, c.l., 12.90c, 2000 lb. to c.l., 13.45c; central, 13.20c and 13.90c; western, 13.85c and 16.80c; min. 96% silicon and max. 2% iron, eastern, bulk, c.l., 12.50c, 2000 lb. to c.l., 13.10c; central, 12.80c and 13.55c; western, 13.45c and 16.50c; f.o.b. shipping point, freight allowed. Prices per lb. contained silicon.

Manganese Metal: (96 to 98% manganese, max. 2% iron), per lb. of metal, eastern zone, bulk, c.l., 36c, 2000 lb. to c.l., 38c, central, 36.25c, and 39c; western, 36.55c and 41.05c; 95 to 97% manganese, max. 2.50% iron, eastern, bulk, c.l., 34c; 2000 c.l., 35c; central, 34.25c and 36c; western, 34.55c and 38.05c; f.o.b. shipping point, freight allowed.

Ferrotungsten: Carlots, per lb. contained tungsten, $1.90.

Tungsten Metal Powder: 98-99% per lb. any quantity $2.55-2.65.

Ferrotitanium: 40-45%, R.R. freight allowed, per lb. contained titanium; ton lots $1.23; less-ton lots $1.25; eastern. Spot up 5 cents per lb.

Ferrotitanium: 20-25%, 0.10 maximum carbon; per lb. contained titanium; ton lots $1.35; less-ton lots $1.40; eastern. Spot 5 cents per lb. higher.

High-Carbon Ferrotitanium: 15-20% contract basis, per gross ton, f.o.b. Niagara Falls, N. Y., freight allowed to destination east of Mississippi River and North of Baltimore and St. Louis, 6-8% carbon $142.50; 3-5% carbon $157.50.

Carbortam: Boron 0.90 to 1.15%, net ton to carload, 8c lb. F.O.B. Suspension Bridge, N. Y., frt. allowed same as high-carbon ferrotitanium.

Bortam: Boron 1.5-1.9%, ton lots 45c lb., less ton lots 50c lb.

Ferrovanadium: 35-55%, contract basis, per lb. contained vanadium, f.o.b. producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Zirconium Alloys: 12-15%, per lb. of alloy, eastern, contract, carlots, bulk, 4.60c, packed 4.80c, ton lots 4.80c, less tons 5c, carloads bulk, per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot ¼c per ton higher.

Zirconium Alloy: 35-40%, Eastern, contract basis, carloads in bulk or package, per lb. of alloy 14.00c; gross ton lots 15.00c; less-ton lots 16.00c. Spot ¼ cent higher.

Alsifer: (Approx. 20% aluminum, 40% silicon, 40% iron) contract basis f.o.b. Niagara Falls, N. Y., per lb. 5.75; ton lots 6.50c. Spot ¼ cent higher.

Simanal: (Approx. 20% each Si., Mn., Al.) Contract, frt. all. not over St. Louis rate, per lb. alloy; carlots 8c; ton lots 8.75c; less ton lots 9.25c.

Borosil: 3 to 4% boron, 40 to 45% Si., $6.25 lb. cont. Bo., f.o.b. Philo, O., freight not exceeding St. Louis rate allowed.

OPEN MARKET PRICES, IRON AND STEEL SCRAP

Following prices are quotations developed by editors of STEEL in the various centers. For complete OPA ceiling price schedule refer to page 156 of Sept. 4, 1944, issue of STEEL. Quotations are on gross tons.

PHILADELPHIA:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Bundles	18.75
No. 2 Bundles	18.75
No. 3 Bundles	16.75
Machine Shop Turnings	13.75
Mixed Borings, Turnings	13.75
Shoveling Turnings	15.75
No. 2 Busheling	15.50
Billet, Forge Crops	21.25
Bar Crops, Plate Scrap	21.25
Cast Steel	21.25
Punchings	21.25
Elec. Furnace Bundles	19.75
Heavy Turnings	18.25

Cast Grades

(F.o.b. Shipping Point)

Heavy Breakable Cast	16.50
Charging Box Cast	19.00
Cupola Cast	20.00
Unstripped Motor Blocks	17.50
Malleable	22.00
Chemical Borings	16.51

NEW YORK:

(Dealers' buying prices.)

No. 1 Heavy Melt. Steel	$15.33
No. 2 Heavy Melt. Steel	15.33
No. 2 Hyd. Bundles	15.33
No. 3 Hyd. Bundles	13.33
Chemical Borings	14.33
Machine Turning	10.33
Mixed Borings, Turnings	10.33
No. 1 Cupola	20.00
Charging Box	19.00
Heavy Breakable	16.50
Unstrip Motor Blocks	17.50
Stove Plate	19.00

CLEVELAND:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.50
No. 2 Heavy Melt. Steel	19.50
No. 1 Comp. Bundles	19.50
No. 2 Comp. Bundles	19.50
No. 1 Busheling	19.50
Mach. Shop Turnings	11.50-12.00
Short Shovel Turnings	13.50-14.00
Mixed Borings, Turnings	11.50-12.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	15.50
Billet, Bloom Crops	24.50
Sheet Bar Crops	22.00
Plate Scrap, Punchings	22.00
Elec. Furnace Bundles	20.50

BOSTON:

(F.o.b. shipping points)

No. 1 Heavy Melt. Steel	$14.06*
No. 2 Heavy Melt. Steel	14.06*
No. 1 Bundles	14.06*
No. 2 Bundles	14.06*
No. 1 Busheling	14.06*
Machine Shop Turnings	9.06
Mixed Borings, Turnings	9.06
Short Shovel, Turnings	11.06*
Chemical Borings	13.06*
Low Phos. Clippings	16.56*
No. 1 Cast	20.00
Clean Auto Cast	20.00
Stove Plate	19.00
Heavy Breakable Cast	16.50

*Inland base ceiling; Boston switching district price 99 cents higher.

PITTSBURGH:

(Delivered consumer's plant)

Railroad Heavy Melting	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 2 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
No. 2 Comp. Bundles	20.00
Mach. Shop Turnings	14.00
Short Shovel, Turnings	16.00
Mixed Borings, Turnings	14.00
No. 1 Cupola Cast	20.00
Heavy Breakable Cast	16.50
Cast Iron Borings	16.00
Billet, Bloom Crops	25.00
Sheet Bar Crops	22.50
Plate Scrap, Punchings	22.50
Railroad Specialties	24.50
Scrap Rail	21.50
Axles	26.00
Rail 3 ft. and under	23.50
Railroad Malleable	21.00

VALLEY:

(Delivered consumer's plant)

No. 1 R.R. Hvy. Melt.	$21.00
No. 1 Heavy Melt. Steel	20.00
No. 1 Comp. Bundles	20.00
Short Shovel Turnings	13.00
Cast Iron Borings	16.00
Machine Shop Turnings	14.00-15.00
Low Phos. Plate	21.00-22.00

MANSFIELD, O.:

(Delivered consumer's plant)

Machine Shop Turnings	11.00-12.00

BIRMINGHAM:

(Delivered consumer's plant)

Billet, Forge Crops	$22.00
Structural, Plate Scrap	19.00
Scrap Rails, Random	18.50
Rerolling Rails	20.50
Angle, Splice Bars	20.50
Solid Steel Axles	24.00
Cupola Cast	20.00
Stove Plate	19.00
Long Turnings	8.50- 9.00
Cast Iron Borings	8.50- 9.00
Iron Car Wheels	16.50-17.00

CHICAGO:

(Delivered consumer's plant)

No. 1 R.R. Hvy. Melt.	$19.75
No. 1 Heavy Melt. Steel	18.75
No. 2 Heavy Melt. Steel	18.75
No. 1 Ind. Bundles	18.75
No. 2 Dlr. Bundles	18.75
No. 3 Galv. Bundles	14.25-14.75
Mix. Borings, Sht. Turn.	8.75- 9.25
Machine Turnings	9.00- 9.50
Short Shovel Turnings	8.75- 9.25
Cast Iron Borings	8.75- 9.25
Scrap Rails	20.25
Cut Rails, 3 feet	22.25
Cut Rails, 18-inch	23.50
Angles, Splice Bars	22.25
Plate Scrap, Punchings	21.25
Railroad Specialties	22.75
No. 1 Cast	20.00
R.R. Malleable	22.00

(Cast grades f.o.b. shipping point, railroad grades f.o.b. tracks)

BUFFALO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$19.25
No. 2 Heavy Melt. Steel	19.25
No. 1 Bundles	19.25
No. 2 Bundles	19.25
No. 1 Busheling	19.25
Machine Turnings	13.75
Short Shovel. Turnings	16.25
Mixed Borings, Turn.	14.25
Cast Iron Borings	13.25
Low Phos.	21.75

DETROIT:

(Dealers' buying prices)

Heavy Melting Steel	$17.32
No. 1 Busheling	17.32
Hydraulic Bundles	17.32
Flashings	17.32
Machine Turnings	9.00- 9.50
Cast Iron Borings	10.00-10.50
Short Turnings	11.00-11.50
Low Phos Plate	19.82
No. 1 Cast	20.00
Heavy Breakable Cast	13.50-14.00

ST. LOUIS:

(Delivered consumer's plant)

Heavy Melting	$17.50
No. 1 Locomotive Tires	20.00
Misc. Rails	19.00
Railroad Springs	22.00
Bundled Sheets	17.50
Axle Turnings	17.00
Machine Turnings	9.50-10.00
Rerolling Rails	21.00
Steel Car Axles	21.50-22.00
Steel Rails, 3 ft.	21.50
Steel Angle Bars	21.00
Cast Iron Wheels	20.00
No. 1 Machinery Cast	20.00
Railroad Malleable	22.00
Breakable Cast	16.50
Stove Plate	19.00
Grate Bars	15.25
Brake Shoes	15.25

(Cast grades f.o.b. shipping point)

Stove Plate	18.00

CINCINNATI:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$18.50
No. 2 Heavy Melt. Steel	18.50
No. 1 Comp. Bundles	18.50
No. 2 Comp. Bundles	18.50
Machine Turnings	7.50- 8.00
Shoveling Turnings	9.50-10.00
Cast Iron Borings	9.50-10.00
Mixed Borings, Turnings	8.50- 9.00
No. 1 Cupola Cast	20.00
Breakable Cast	16.50
Low Phosphorus	21.00-21.50
Scrap Rails	20.50-21.00
Stove Plate	16.00-16.50

LOS ANGELES:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$14.00
No. 2 Heavy Melt. Steel	13.00
No. 1, 2 Deal. Bundles	12.00
Machine Turnings	4.50
Mixed Borings, Turnings	4.00
No. 1 Cast	20.00

SAN FRANCISCO:

(Delivered consumer's plant)

No. 1 Heavy Melt. Steel	$15.50
No. 2 Heavy Melt. Steel	14.50
No. 1 Busheling	15.50
No. 1, No. 2 Bundles	13.50
No. 3 Bundles	9.00
Machine Turnings	6.90
Billet, Forge Crops	15.50
Bar Crops, Plate	15.50
Cast Steel	15.50
Cut Structural, Plate, 1", under	18.00
Alloy-free Turnings	7.50
Tin Can Bundles	14.50
No. 2 Steel Wheels	16.00
Iron, Steel Axles	23.00
No. 2 Cast Steel	15.00
Uncut Frogs, Switches	16.00
Scrap Rails	16.00
Locomotive Tires	16.00

NONFERROUS METAL PRICES

Copper: Electrolytic or Lake from producers in carlots 12.00c, Del. Conn., less carlots 12.12½c, refinery; dealers may add ¾c for 5000 lbs. to carload; 1000-4999 lbs. 1c; 500-999 1½c; 0-499 2c. Casting, 11.75c, refinery for 20,000 lbs., or more, 12.00c less than 20,000 lbs.

Brass Ingot: Carlot prices, including 25 cents per hundred freight allowance; add ¼c for less than 20 tons; 85-5-5-5 (No. 115) 13.00c; 88-10-2 (No. 215) 16.50c; 80-10-10 (No. 305) 15.75c; Navy G (No. 225) 16.75c; Navy M (No. 245) 14.75c; No. 1 yellow (No. 405) 10.00c; manganese bronze (No. 420) 12.75c.

Zinc: Prime western 8.25c, select 8.35c, brass special 8.50c, intermediate 8.75c, E. St. Louis, for carlots. For 20,000 lbs. to carlots add 0.15c; 10,000-20,000 0.25c; 2000-10,000 0.40c; under 2000 0.50c.

Lead: Common 6.35c, chemical, 6.40c, corroding, 6.45c, E. St. Louis for carloads; add 5 points for Chicago, Minneapolis-St. Paul, Milwaukee-Kenosha districts; add 15 points for Cleveland-Akron-Detroit area, New Jersey, New York state, Texas, Pacific Coast, Richmond, Indianapolis-Kokomo; add 20 points for Birmingham, Connecticut, Boston-Worcester-Springfield, New Hampshire, Rhode Island.

Primary Aluminum: 99% plus, ingots 15.00c del., pigs 14.00c del.; metallurgical 94% min. 13.50c del. Base 10,000 lbs. and over; add ½c 2000-9999 lbs.; 1c less than 2000 lbs.

Secondary Aluminum: All grades 12.50c per lb. except as follows: Low-grade piston alloy (No. 122 type) 10.50c; No. 12 foundry alloy (No. 2 grade) 10.50c; chemical warfare service ingot (92½% plus) 10.00c; steel deoxidizers in notch bars, granulated or shot, Grade 1 (95-97½%) 11.00c, Grade 2 (92-95%) 9.50c to 9.75c, Grade 3 (90-92%) 8.50c to 8.75c, Grade 4 (85-90%) 7.50c to 8.00c; any other ingot containing over 1% iron, except PM 754 and hardness, 12.00c. Above prices for 30,000 lb. or more; add ¼c 10,000-30,000 lb.; ½c 1000-10,000 lbs.; 1c less than 1000 lbs. Prices include freight at carload rate up to 75 cents per hundred.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lbs.), 20.50c lb., add 1c for special shapes and sizes. Alloy ingots, incendiary bomb alloy, 23.40c; 50-50 magnesium-aluminum, 23.75c; ASTM B93-41T, Nos. 2, 3, 4, 12, 13, 14, 17, 23.00c; Nos. 4X, 11, 13X, 17X, 25.00c; ASTM B107-41T, or B-90-41T, No. 8X, 23.00c; No. 18, 23.50c; No. 18X, 25.00c. Selected magnesium crystals, crowns, and muffs, including all packing screening, barrelling, handling, and other preparation charges, 23.50c. Prices for 100 lbs. or more; for 25-100 lbs., add 10c; for less than 25 lbs., 20c. Incendiary bomb alloy, f.o.b. plant, any quantity; carload freight allowed all other alloys for 500 lbs. or more.

Tin: Prices ex-dock, New York in 5-ton lots. Add 1 cent for 2240-11,199 lbs., 1½c 1000-2239. 2½c 500-999, 3c under 500. Grade A, 99.8% or higher (includes Straits), 52.00c; Grade B, 99.8% or higher, not meeting specifications for Grade A, with 0.05 per cent maximum arsenic, 51.87½c; Grade C, 99.65-99.79% incl. 51.62½c; Grade D, 99.50-99.64% incl., 51.50c; Grade E, 99-99.49% incl. 51.12½c; Grade F, below 99% (for tin content), 51.00c.

Antimony: American, bulk carlots f.o.b. Laredo, Tex., 99.0% to 99.8% and 99.8% and over but not meeting specifications below, 14.50c; 99.8% and over (arsenic, 0.05%, max. and other impurities, 0.1%, max.) 15.00c. On producers' sales add ¼c for less than carload to 10,000 lb.; ½c for 9999-224-lb.; and 2c for 223 lb. and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.5%, f.o.b. refinery 35.00c lb.; pig and shot produced from electrolytic cathodes 36.00c; "F" nickel shot or ingot for additions to cast iron, 34.00c; Monel shot 28.00c.

Mercury: OPA ceiling prices per 76-lb. flask f.o.b. point of shipment or entry. Domestic produced in Calif., Oreg., Wash., Idaho, Nev., Ariz., $191; produced in Texas, Ark. $193. Foreign, produced in Mexico, duty paid, $193. Open market, spot, New York, nominal for 50 to 100 flasks; $170 to $172 in smaller quantities.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Beryllium-Copper: 3.75-4.25% Be., $17 lb. contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, rods, slabs, sticks and all other "regular" straight or flat forms 90.00c lb., del.; anodes, balls, discs and all other special or patented shapes 95.00c lb. del.

Cobalt: 97-99%, $1.50 lb. for 550 lb. (bbl.); $1.52 lb. for 100 lb. (case); $1.57 lb. under 100 lb.

Indium: 99.9%, $7.50 per troy ounce.

Gold: U. S. Treasury, $35 per ounce.

Silver: Open market, N. Y. 44.75c per ounce.

Platinum: $35 per ounce.

Iridium: $165 per troy ounce.

Palladium: $24 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 12.00c, Conn., for copper. Freight prepaid on 100 lbs. or more.)

Sheet: Copper 20.87c; yellow brass 19.48c; commercial bronze, 90% 21.07c, 95% 21.28c; red brass, 80% 20.15c, 85% 20.36c; phosphor bronze, Grades A and B 5% 36.25c; Everdur, Herculoy, Duronze or equiv. 26.00c; naval brass 24.50c; manganese bronze 28.00c; Muntz metal 22.75c; nickel silver 5% 26.50c.

Rods: Copper, hot-rolled 17.37c, cold-rolled 18.37c; yellow brass 15.01c; commercial bronze 90% 21.32c, 95% 21.53c; red brass 80% 20.40c, 85% 20.61c; phosphor bronze Grade A, B 5% 36.50c; Everdur, Herculoy, Duronze or equiv. 25.50c; Naval brass 19.12c; manganese bronze 22.50c; Muntz metal 18.87c; nickel silver 5% 26.50c.

Seamless Tubing: Copper 21.37c; yellow brass 22.23c; commercial bronze 90% 23.47c; red brass 80% 22.80c, 85% 23.01c.

Extruded Shapes: Copper 20.87c; architectural bronze 19.12c; manganese bronze 24.00c, Muntz metal 20.12c; Naval brass 20.37c.

Angles and Channels: Yellow brass 27.98c; commercial bronze 90% 29.57c, 95% 29.78c; red brass 80% 28.65c, 85% 28.86c.

Copper Wire: Soft, f.o.b. Eastern mills, carlots 15.37½c, less-carlots 15.87½c; weatherproof, f.o.b. Eastern mills, carlots 17.00c, less-carlots 17.50c; magnet, delivered, carlots 17.50c, 15,000 lbs. or more 17.75c, less carlots 18.25c.

Aluminum Sheets and Circles: 2s and 3s, flat, mill finish, base 30,000 lbs. or more; del.; sheet widths as indicated; circle diameters 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers; full sheets 9.50c; cut sheets 9.75c; pipe 8.15c, New York; 8.25c, Philadelphia, Baltimore, Rochester and Buffalo; 8.75c, Chicago, Cleveland, Worcester, Boston.

Zinc Products: Sheet f.o.b. mill, 13.15c; 36,000 lbs. and over deduct 7%. Ribbon and strip 12.25c, 3000-lb. lots deduct 1%, 6000 lbs. 2% 9000 lbs. 3%, 18,000 lbs. 4%, carloads and over 7%. Boiler plate (not over 12") 3 tons and over 11.00c; 1-3 tons 12.00c; 500-2000 lbs. 12.50c; 100-500 lbs. 13.00c; under 100 lbs. 14.00c. Hull plate (over 12") add 1c to boiler plate prices.

Plating Materials

Chromic Acid: 99.75%, flake, del., carloads 16.25c; 5 tons and over 16.75c; 1-5 tons 17.25c; 400 lbs. to 1 ton 17.75c; under 400 lbs. 18.25c.

Copper Anodes: Base 2000-5000 lbs., del.; oval 17.62c; untrimmed 18.12c; electro-deposited 17.37c.

Copper Carbonate: 52-54% metallic cu, 250 lb. barrels 20.50c.

Copper Cyanide: 70-71% cu, 100-lb. kegs or bbls. 34.00c f.o.b. Niagara Falls.

Sodium Cyanide: 96%, 200-lb. drums 15.00c; 10,000-lb. lots 13.00c f.o.b. Niagara Falls.

Nickel Anodes: 500-2999 lb. lots; cast and rolled carbonized 47.00c; rolled, depolarized 48.00c.

Nickel Chloride: 100-lb. kegs or 275-lb. bbls. 18.00c lb., del.

Tin Anodes: 1000 lbs. and over 58.50c, del.; 500-999 59.00c; 200-499 59.50c; 100-199 61.00c.

Tin Crystals: 400 lb. bbls. 39.00c f.o.b. Grasselli, N. J.; 100-lb. kegs 39.50c.

Sodium Stannate: 100 or 300-lb. drums 36.50c, del.; ton lots 33.50c.

Zinc Cyanide: 100-lb. kegs or bbls. 33.00c, f.o.b. Niagara Falls.

Scrap Metals

Brass Mill Allowances: Prices for less than 15,000 lbs. f.o.b. shipping point. Add ⅝c for 15,000-40,000 lbs.; 1c for 40,000 lbs. or more.

	Clean Heavy	Rod Ends	Clean Turnings
Copper	10.250	10.250	9.500
Tinned Copper	9.625	9.625	9.375
Yellow Brass	8.625	8.375	7.875
Commercial bronze			
90%	9.375	9.125	8.625
95%	9.500	9.250	8.750
Red Brass, 85%	9.125	8.875	8.375
Red Brass, 80%	9.125	8.875	8.375
Muntz metal	8.000	7.750	7.250
Nickel Sil., 5%	9.250	9.000	4.625
Phos. br., A, B, 5%	11.000	10.750	9.750
Herculoy, Everdur or equivalent	10.250	10.000	9.250
Naval brass	8.250	8.000	7.500
Mang. bronze	8.250	3.000	7.500

Other than Brass Mill Scrap: Prices apply on material not meeting brass mill specifications and are f.o.b. shipping point; add ¾c for shipment of 60,000 lbs. of one group and ½c for 20,000 lbs. of second group shipped in same car. Typical prices follow:

(Group 1) No. 1 heavy copper and wire, No. 1 tinned copper, copper borings 9.75c; No. 2 copper wire and mixed heavy copper, copper tuyeres 8.75c.

(Group 2) soft red brass and borings, aluminum bronze 9.00c; copper-nickel and borings 9.25c; car boxes, cocks and faucets 7.75c; bell metal 15.50c; babbit-lined brass bushings 13.00c.

(Group 3) zincy bronze borings, Admiralty condenser tubes, brass pipe 7.50c; Muntz metal condenser tubes 7.00c; yellow brass 6.25c; manganese bronze (lead 0.00%-0.40%) 7.25c, (lead 0.41%-1.0%) 6.25c; manganese bronze borings (lead 0.00-0.40%) 6.50c, (lead 0.41-1.00%) 5.50c.

Aluminum Scrap: Prices f.o.b. point of shipment, respectively for lots of less than 1000 lbs.; 1000-20,000 lbs. and 20,000 lbs. or more, plant scrap only. Segregated solids: S-type alloys (2S, 3S, 17S, 18S, 24S, 32S, 52S) 9.00c, 10.00c, 10.50c; All other high grade alloys 8.50c, 9.50c, 10.00c; low grade alloys 8.00c, 9.00c, 9.50c. Segregated borings and turnings: Wrought alloys (17S, 18S, 32S, 52S) 7.50c, 8.50c, 9.00c; all other high grade alloys 7.00c, 8.00c, 8.50c; low grade alloys 6.50c, 7.50c, 8.00c. Mixed plant scrap, all solids, 7.50c, 8.50c, 9.00c; borings and turnings 5.50c, 6.50c, 7.00c.

Lead Scrap: Prices f.o.b. point of shipment. For soft and hard lead, including cable lead, deduct 0.55c from basing point prices for refined metal.

Zinc Scrap: New clippings, old zinc 7.25c f.o.b. point of shipment; add ½-cent for 10,000 lbs. or more: New die-cast scrap, radiator grilles 4.95c, add ½c 20,000 or more. Unsweated zinc dross, die cast slab 5.80c any quantity.

Nickel, Monel Scrap: Prices f.o.b. point of shipment; add ½c for 2000 lbs. or more of nickel or cupro-nickel shipped at one time and 20,000 lbs. or more of Monel. Converters (dealers) allowed 2c premium.

Nickel: 98% or more nickel and not over ½% copper 26.00c; 90-98% nickel, 26.00c per lb. nickel contained.

Cupro-nickel: 90% or more combined nickel and copper 26.00c per lb. contained nickel, plus 8.00c per lb. contained copper; less than 90% combined nickel and copper 26.00c for contained nickel only.

Monel: No. 1 castings, turnings 15.00c; new clipping 20.00c; soldered sheet 18.00c.

Sheets, Strip . . .

Sheet & Strip Prices, Page 204

Tightness continues in sheets and strip, deliveries being further extended in most grades, many producers now offering September as their best. With delivery so remote buying has slackened somewhat but still exceeds production. Galvanized sheets have been bought into February of next year. Some additional sheet capacity has been diverted to plates for shipbuilding.

New York — Although some hot and cold-rolled sheet tonnage is still available in August, most producers now quote September and beyond. In general, backlogs are not being built up quite as rapidly as a few weeks ago, but incoming tonnage is still in excess of production. Reasons for easing are that tonnage against many of the more substantial programs has been placed and that delivery schedules have now reached the point where it is difficult for many consumers to plan so far ahead. At the same time, in galvanized sheets the latter does not seem to be so much of a deterring factor and orders have been placed to the extent that some mills have nothing to offer before January and February of next year.

Stainless steel sheets continue in expanding demand, despite limitations on end uses. Certain sellers now claim they have little stainless available before August; silicon sheets likewise are in increasing demand, with producers quoting August and September, on hot-rolled and in one case now quoting January on cold-rolled sheets of the lowest silicon grade. This latter represents a jump of about three months in a period of two to three weeks. This increase is ascribed not only to heavy demand for light inexpensive motors, used for infrequent service, but to limited processing facilities, including other than actual rolling. Hot low-silicon sheets also can be used for such motors, but many of the large motor manufacturers prefer coiled material which is produced on cold reduced mills.

Cincinnati — Sheets are exceedingly tight, partly because directives have been heavy. Mill schedules are overloaded into November on hot-rolled and on cold-rolled to October. The delivery situation has been further complicated by stocking of sheets for which transportation was not available. Shipping now faces less handicap, but there is still difficulty in moving material.

St. Louis — Demand for sheets continues heavy for war needs and nonpriority calls are increasing. Producers see no chance for easing before the end of the year. Present order backlog would carry them seven months into 1946. Pressure is increased by shift of much sheetmaking capacity to plates for ships. Galvanized sheets are in strong demand for agricultural products, navy quonset huts and roadbuilding materials.

Boston — Extensions of contracts for shell containers, ammunition boxes and miscellaneous ordnance components have developed another wave of sheet and strip buying, notably for third quarter delivery. Scattered new contracts also contribute to heavier inquiry and shipment on these inquiries is wanted ahead of schedule openings. A Holyoke, Mass., fabricator wants 1000 tons of No. 18-gage cold-rolled sheets beginning in June, one of numerous similar instances. Against contracts placed in December and January most steel has been covered, resulting in slight decline in buying during late February, but there has been a rebound. Not all tonnage placed earlier has a firm position on schedules and requests for directives are frequent. To ease this pressure, which is displacing considerable CMP volume and increasing carryovers, sharp cutbacks in Class B products are foreseen. Against some spot contracts steel allocations are late, further confusing the situation as warehouses are less able to fill such requirements. Sheet deliveries range from August to the end of the year, with most mills unable to accept earlier tonnage. Narrow cold strip deliveries have lengthened a month with some producers and September schedules are about filled. Hot mill deliveries lag three to four weeks to rerollers and some integrated units are sold through the year on both hot and cold-rolled strip.

Philadelphia — Considerable divergence in sheet deliveries is noted. One large producer has hot-rolled available for August while certain others are booked into November and December, especially where sheets are to be pickled and oiled. Some sellers offer cold-rolled sheets for September, others for December and January. Galvanized tonnage still can be had in September from certain mills, compared with as late as January and February from others. Narrow hot strip schedules also are irregular, one seller being booked to November on anything under two inches, to August on two

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to four inches, April, 1945, on four to nine inches and November on nine to twelve-inch.

Chicago — It has become known that the Navy is going ahead with its plans to purchase 1951 warehouse buildings and probably directives will be needed to get the required 12,000 tons of roofing sheets for them. Sheet demand increases weekly and backlogs have become tremendous. Directives push out CMP tonnage on order books. A local sheetmaker has booked 7200 tons of 10-gage hot-rolled sheets from a district maker of landing mats, to cover August through November, this year.

Pittsburgh — One of the most difficult situations in steel products is on sheet mills. Tonnage has been placed as far ahead as first quarter, 1946, and on many mills carryovers are now as high as the directive, which is 110 per cent of actual capacity. On practically all mills the carry-over is more than 50 per cent of monthly capacity, with new placements coming in continually and still running above shipments. The chief drawback is manpower in that even addition of new facilities would not help because there are no trained men to operate them. It is reported that some consideration is being given to a complete freeze of sheet mill schedules. This would mean that a cancellation could not be replaced except by order of WPB. Such a freeze order has been in operation before and proved workable, and it is not improbable that it will be evoked again.

Cleveland — Orders continue to average about 25 to 30 per cent ahead of this time last year. Sellers report largest order backlogs of the war period and delivery is becoming more extended, causing some consumers to ask WPB allotment as far ahead as first and second quarters of 1946.

A new item on the critical list is containers, with production cuts scheduled for practically all kinds due to the growing steel shortage for drums and strapping. The most critical needs are in small drums and pails, with prospect of further substantial Army, Navy and Air Force requirement increase.

Steel Bars . . .

Bar Prices, Page 204

Frequent efforts to obtain bar shipments on new orders during second quarter for pressing war needs find little response since use of directives has been limited, in view of the confusion resulting from prior use of this instrument. Hot-rolled deliveries on medium sizes run into August and on larger diameters into September and October. Alloy steel bars are available in third quarter, second quarter being nearly sold out.

New York—Much pressure for nearby deliveries on bars continues, notwithstanding efforts by Washington to reduce directives that have been proving so confusing to producers over recent weeks. For instance, one inquiry is before the trade here for 9000 tons of cold-drawn hexagons for delivery in April. Not only are deliveries on all shapes far beyond that, but this is particularly true on hexagons. The tonnage is required for the incendiary bomb program, but there is question as to whether a directive will be issued.

Producers of cold-drawn bars quote deliveries from July into early fourth quarter and in no case so far as can be learned, can anyone ship hexagons much before August. Certain sellers of cold-drawn rounds quote August on smaller sizes and as late as October and November on larger. Much of the larger diameter cold-drawn bar tonnage is going into rockets. A wide range of sizes is going into fuzes and adapters for mortars and bombs, with an increasing tonnage in small sizes going into light ammunition.

Hot carbon bar schedules cover a substantial range, although probably averaging around August on medium sizes and September and October on larger.

Little alloy steel is now available in first half, even electric furnace alloy bars now being offered by most producers for shipment in third quarter. In general electric furnace alloy bars are available in July, and open-hearth alloy bars, late August and September.

St. Louis — Bar demand is increasing, except for building items, with mills sold through June to September. WPB has distributed its second quarter business but considerable bar and strip capacity is sold through third quarter. Meanwhile many consumers seek to place orders for shell and bomb components and shipping containers. Inquiries for a special section for fragmentation bombs are numerous.

Boston — Alloy bar deliveries continue to lengthen, hot-rolled open-hearth being in August and if heat treated, in September. Electric furnace and cold-finished are slightly better. Carbon bar

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buying has subsided and most fabricators with shell contracts have covered, mainly by directives. Second quarter delivery of shell steel, billets and rounds, will be heavy, making a peak in September in some cases. This supplements strong buying by forge shops, bolt and nut producers, arsenals and miscellaneous users. While small carbon bars are available in July and August, stock above 1½-inch is well into September and beyond.

Philadelphia — Practically all carbon bar producers are booked solidly for first half, with only smaller rounds available for July shipment. One large eastern seller has no carbon material available before August, with large specifications falling in September and beyond. One producer quotes December on rounds 7½ inches in diameter and larger. In most cases open-hearth alloy bars are being quoted on approximately the same schedule as carbon steel. Electric furnace alloys can still be had in June.

Pittsburgh — Already loaded by demands from the shell program, bar mills are troubled by shortage of cars. At least one major bar mill has been down for several days because no rolling stock is available and storage space at the mill is filled. It is estimated that 10 per cent of all steel now being produced is going into the shell program, a good part of which passes through bar mills.

Cleveland — Sellers report further tightening in deliveries of both carbon and alloy steel bars. The increase in alloy buying is being maintained in slightly better ratio than for carbon grades. Mill deliveries are extended into third quarter on small size bar stock, and into fourth on large rounds.

Chicago — Forge shops have heavy backlogs and considerable new business is pending. In this district, however, the critical manpower shortage prevents capacity operations, and limits new business that can be booked. Growing demand for shell rounds complicates production of carbon and forging quality bars.

Steel Plates . . .

Plate Prices, Page 205

Expected decline in steel plate demand has been deferred somewhat by renewed shipbuilding contracts, but gradual lessening is foreseen for later months this year. Deliveries on current orders are available in June and July, with floor plates in May. Additional ship orders by the Navy are making up in some degree for lessened cargo ship production. Maritime Commission tankers are also on inquiry.

Boston — By the end of second quarter, unless further contracts are forthcoming, three major shipyards in this area will be about done. Walsh-Kaiser yard at Providence, R. I., has 12 combat-cargo craft to complete but has bid on 12 of 24 diesel-powered, single-screw, 230-foot tankers for the Maritime Commission. Partially offsetting further prospective decline in maritime and small naval craft construction is placing of heavier combat ships with Boston Navy Yard, Bethlehem-Fore River, Quincy, Mass., and Bath Iron Works. Until steel is allocated for the new navy ships demand for plates slackens. Smaller yards are curtailing and others are taking from inventory as much steel as can be fabricated in current operations. Pontoons are taking much less steel for the 1945 program. Floor plates are available in May, compared with June and July for universal and sheared. Heads and flanged plates can be shipped in four to five weeks. Railroads have covered through July, mainly for repairs.

Distribution of new navy contracts includes an Essex-type carrier to Bethlehem-Fore River yard, eight destroyers to Bath Iron Works and four destroyers to Boston Navy Yard.

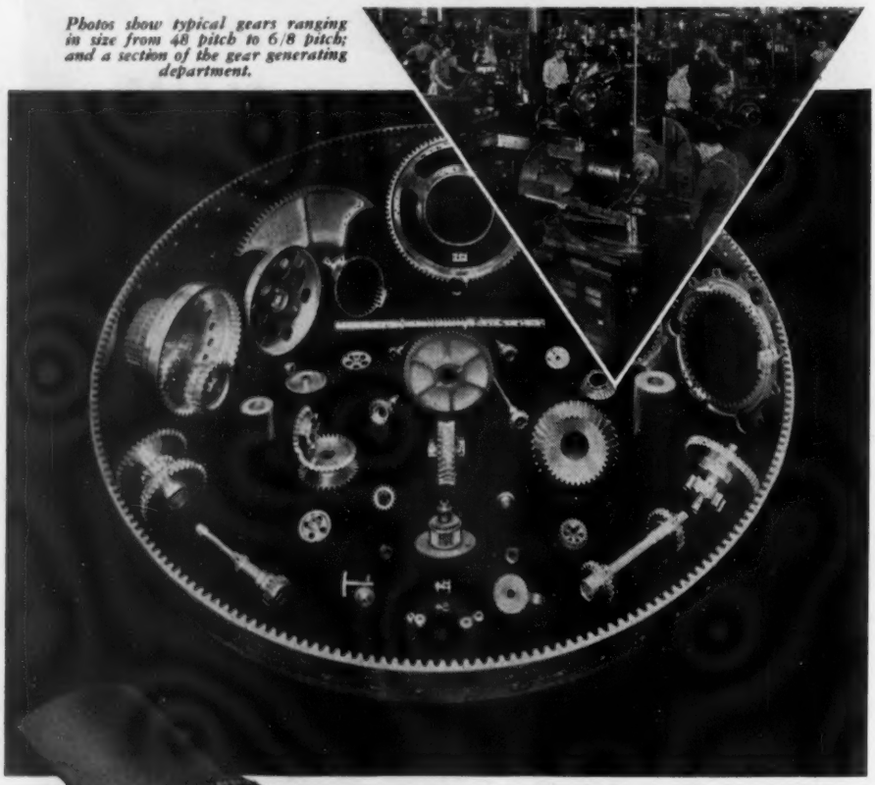
New York — Plate fabrication here will be bolstered by scheduling of 16 additional warships in district yards. The largest will be two 27,000-ton Essex class aircraft carriers, to be constructed in the navy yard on ways recently released. The remainder involve eight 2200-ton destroyers to be built at Mariners Harbor yard of Bethlehem Steel Co., Staten Island, and six other destroyers of the same type at the Federal Shipbuilding & Dry Dock Co. yard at Kearney, N. J. Materials for these ships are now being placed.

Plate demand in general is well sustained, especially for ship repair work, as well as for new ship construction. Deliveries range from June to July.

St. Louis — The plate situation shows improvement as a work stoppage was ended by rearrangement of schedules. Diversion of steel facilities to ship plate production is still in effect, with a change back predicted for May. At present schedules are not being met, because of labor shortage.

Philadelphia — Plate deliveries now

Photos show typical gears ranging in size from 48 pitch to 6/8 pitch; and a section of the gear generating department.



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KEEP ON BUYING WAR BONDS

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are quoted for June and beyond in practically all inquiries. One large producer recently offering April now is in June. Demand has developed for No. 12-gage hot-rolled sheets for bomb fins, with need so urgent that makers are willing to take overruns. Shell container requirements are expanding further and additional landing mat specifications are coming out. Some plate tonnage for the new navy program will be rolled as early as April, with schedules generally over several months. In addition to this navy work an inquiry has been issued for at least ten 250-foot tankers.

Chicago — Despite the belief that shipbuilding plate load will show significant decline in second quarter, mill backlogs indicate heavy output will be necessary through third quarter. First openings for one important producer in the district are September for sheared plates and August for universal. The slack of shipbuilding apparently will be taken up by locomotive, car building, oil industry, and other requirements.

Pittsburgh — From a position a year ago as the most critical product in the industry, the plate situation has now reversed and deliveries are actually easy at some points. There is gossip of additional large tonnages to be placed shortly, but plate mill operators expect to take anything from now on in stride and feel that it will not be necessary again to call on sheet and strip mills to aid production of plates.

Tubular Goods . . .

Tubular Goods Prices, Page 205

New York — Reflecting not only substantial orders for the 1200 locomotives recently placed in this country by France and Russia, but also requirements for a new program involving destroyers and aircraft carriers, deliveries on boiler tubing are being extended well into third quarter in some cases. On certain sizes of cold-drawn tubing one producer is out of the market until October. Requirements for locomotives, it is understood, have now been completely covered.

On butt-weld and lap-weld, producers are quoting May and June, for the most part, with distributors still pressing for tonnage in an effort to balance stocks.

Were it not for recent limitations on future purchases of oil company goods, orders on this type of pipe would be substantially heavier. There has been heavy demand for oil country pipe for shipment to Venezuela and certain other South American countries.

Boston — Substantial part of the shell program takes hot-rolled seamless tubing, wanted starting in June and July. Mill schedules are into October and beyond on some sizes and directives on most requirements are inevitable. At least four contractors will need thousands of feet, mainly WD X 1335 grade, 4 11/32-inch O.D. and 0.375-inch wall. Peak delivery is wanted by September in some cases. Larger diameter, thicker wall tubing will be required for 500-pound general purpose bombs to be produced at Portland, Me., East Boston and Providence. Demand for merchant steel pipe, centered with jobbers, is steady but not brisk, with some further slackening for ships. May and June deliveries are possible on butt and lap-weld. Direct car lot orders for pipe are scattered but include 350 tons by a Worcester district sprinkler equipment supplier.

Cleveland — Second quarter carbon steel requirements of the petroleum industry (before final screening by WPB) have been placed at 436,000 net tons. This represents a substantial increase over the stated first quarter requirements of 397,000 tons. Actual allocation of pipe tonnage for the second quarter, however, is expected to be well below stated requirements because of the overall steel shortage. Chief difficulty is shortage of billets for seamless tubing and skelp. Tube mills have unusually large order backlogs, but manpower shortages prevent capacity operations. A total of 4961 miles of new pipe lines were completed in 1944, marking the first time since 1940 that the figure fell below 7000 miles.

Tin Plate . . .

Tin Plate Prices, Page 205

Pittsburgh — There has been no definite word on second-quarter tin plate program, although most sources believe it will follow pretty closely the March pattern, which would mean approximately 825,000 tons for the quarter. The chief difficulty is in delivering the finished plate. Car shortages have resulted in heavy increases in mill stocks and there is no apparent solution to the difficult loading problem. New buying is heavy and second-quarter books are virtually filled.

St. Louis — The tin plate situation was left unchanged when Washington

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fixed requirements for second quarter the same as the first, 825,000 tons. Main pressure for that product is for food containers for the armed services.

Wire . . .

Wire Prices, Page 205

Boston — Supply of semifinished is short, endangering production at a New England rope mill where revisions have resulted in loss of some critical grades, due to lack of high-carbon rods. Except on directive in one case, shipment of rods by this supplier has ceased, reflecting losses in hot mill production from raw material losses. Volume of incoming orders continues and more are on directives. Consumers just outside the directive circle but engaged indirectly in essential production, are placing orders as far ahead as third quarter. Practically all new orders in this class are accepted tentatively with processing subject to open spots in later schedules.

Rails, Cars . . .

Track Material Prices, Page 205

New York — Domestic freight car orders in February amounted to 1750 cars, according to preliminary estimates. This represents a sharp drop from January when 7200 freight cars were placed by domestic lines. Export orders in February, however, were the heaviest in some time, involving 7265, of which practically all were for shipment to Russia. Locomotive buying for export in February also was unusually heavy, with 700 placed for France and 500 for Russia.

Five thousand flat cars, equipped with side frames, for Russia, have been placed, 3000 going to Pullman-Standard Car Mfg. Co., Chicago, and 2000 to American Car & Foundry Co., New York. Domestic buying includes 50 seventy-ton triple hopper cars for the Donora Southern, also placed with American Car & Foundry Co.

Pittsburgh — The sharp reduction in second-quarter directives to ODT does not necessarily mean any decline in activity at rail mills or car shops. Substantial tonnage of rails and large numbers of cars are headed for Russia through military procurement sources and to France through lend-lease. Rail mills are being pushed to provide combined tonnage of rail and shell billets. With continued increase in the shell program, it is becoming more difficult to schedule sufficient quantities of rails.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 205

New York — Award of 4600 tons for storm water outlets for the municipal Idlewild airport, Queens, is the largest letting here. One section, involving 2000 tons, was placed through N. Dimenna & Sons, Bronx, with Truscon Steel Co., while another, involving 2600 tons, was placed through A. Catapano, Glendale, Long Island, with Igoe Bros. Other awards are small, averaging around 15 to 20 tons each. The leading inquiry calls for 300 tons for the Norwalk Tire Co., Norwalk, Conn.

Chicago—Despite restricted output of reinforcing steel, inquiry is developing at a better pace than witnessed in several months. Individual jobs range from 100 to 400 tons, although the new veterans' hospital to be built in Tomah, Wis., with bids closing March 20, is expected to require about 1000 tons. In the case of several ordnance works being expanded in the midwestern area, requirements for bars are being met from surplus government stocks.

Structural Shapes . . .

Structural Shape Prices, Page 205

Boston — Except for spotty shipyard buying, demand for structural shapes lags, reflected notably in slackening operations in shops formerly heavily engaged with ship assembly subcontracts. Most of these shops now are seeking tonnage. A cutback gap in military bridge contract at a Boston district shop has not been filled. Large unit subassemblies are being fabricated by Harris Structural Steel Co. at its New Jersey plant for Walsh-Kaiser Co., Providence, R. I., and by Phoenix Iron Co., Phoenixville, Pa., for Boston navy yard. Sections are towed to the respective prime yards, the latter from Philadelphia. While sometimes pressing for tonnage on order, warehouses are placing orders in less volume. Depending on size, deliveries are in May and June.

New York — Structural activity is still confined to relatively small jobs, with the leading inquiry involving approximately 200 tons for a power plant at Sarasota, Fla., on which Ebasco Services Inc., 2 Rector street, New York, is taking bids. Structural buying includes 130 tons for repairs and alterations to a

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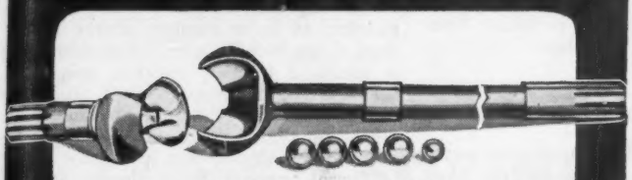

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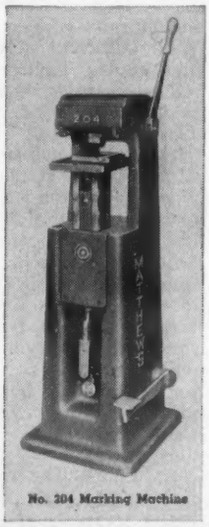

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Philadelphia — Shape deliveries range from May to July with little available for the earlier month. A large producer who a week ago was in June on standard shapes now is in July on standard as well as wide flange sections. Schedules already reflect the new navy program.

Chicago — Structural fabricators find new business in the Midwest picking up moderately, but the problem is to obtain standard shapes. All structural mills are heavily booked and directives are needed to obtain tonnage for important war jobs in reasonable time. New inquiring for fabrication is coming out in better volume than in weeks. U. S. Engineers, Columbus, O., is taking bids on 391 large portable hangars.

Pig Iron . . .

Pig Iron Prices, Page 207

Clearing of the freight tangle has eased the supply situation for many pig iron consumers, but some cars still are delayed. Basic stocks at the New England furnace have been completely allocated and supplies of this grade in future will come from outside. Second quarter buying will start soon and indications are tonnage will be equal to or larger than in first quarter. Many inventories are well below the 30-day limit.

New York — Buying for second quarter is expected to start soon, although possibly in more limited degree at first than three months ago. This possibility is ascribed to two reasons, one being that consumers generally are still principally engaged in getting in tonnage to meet their immediate demand and the other being the 30-day inventory ruling.

There appears little doubt that as much iron will be consumed in second quarter as in the current period, however. In fact, with the manpower situation being given a greater opportunity to adjust itself, it appears likely that pig iron melt may be even heavier in the next three months. At the same time there may be a somewhat better flow of scrap, which might relieve some pressure for iron. But even this may not be much of a factor, as there is a fundamental shortage of cast grades.

While there is still some difficulty at some plants in getting iron for nearby shipment (some carlots even now still being lost in transit) the general flow is somewhat better, as traffic congestion is unsnarled. In fact, some consumers have received more iron than they can conveniently unload with present limited manpower.

Export inquiry continues to be confined chiefly to small lots for South America and the Near East, and with few exceptions they involve American standard grades of foundry iron. In view of shortage for domestic requirements Washington is closely checking foreign inquiries and even where tonnages are approved producers show only limited interest.

Boston — Pig iron inventories with numerous consumers are below 30 days and slight progress is being made in building up stocks beyond current requirements. Deliveries are still erratic. Several melters held up shipments last month and a few will in March. Foundries with sufficient iron to permit shipment suspension are exceptions but include several textile machinery plants. Most press for deliveries. In some cases inventories are deceptive as to balance. With sufficient stocks of some silicons and grades, melters are low on others, indicated by acceptance of shipments 50 points or more off the silicon wanted. The remainder of basic stock at the district furnace has been taken up by the Rhode Island steelmaker and when this is gone all basic will come from outside, mainly from Buffalo, by rail until water transportation opens. Steelworks inventories are still below normal. With continued revisions in melting schedules most consumers expect to weather the critical March period without major shutdowns, though there is less iron for emergency loans. There also is indication of slightly heavier melt for textile mill equipment and a large South Boston foundry already has increased schedules.

St. Louis—Pig iron still is tight. Steelmaking needs are being met by slightly better scrap supply. Worst sufferers are foundries without priorities, many of which are on a day to day basis. A saving factor is labor shortage which limits production.

Buffalo — With improved railroad car service only about 1000 tons of iron piled during the rail tangle remains unshipped. Manpower shortage is the main restrain-

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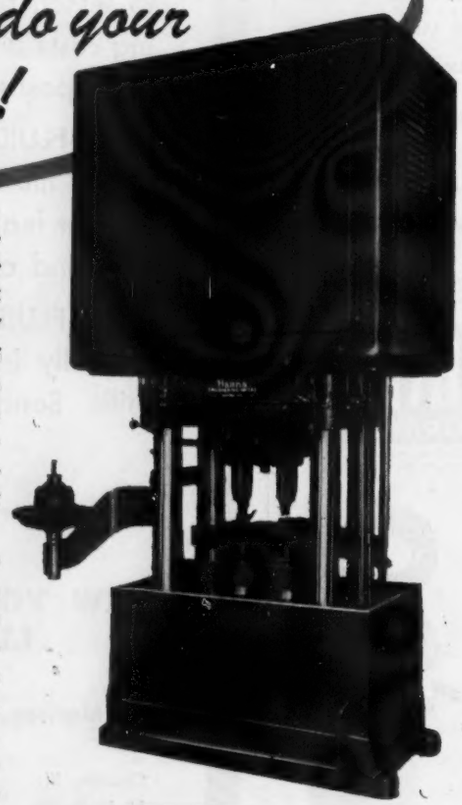

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ing factor in foundry operations. Heavy volume of navy work has been added to backlogs. Second quarter orders are expected to cover capacity production.

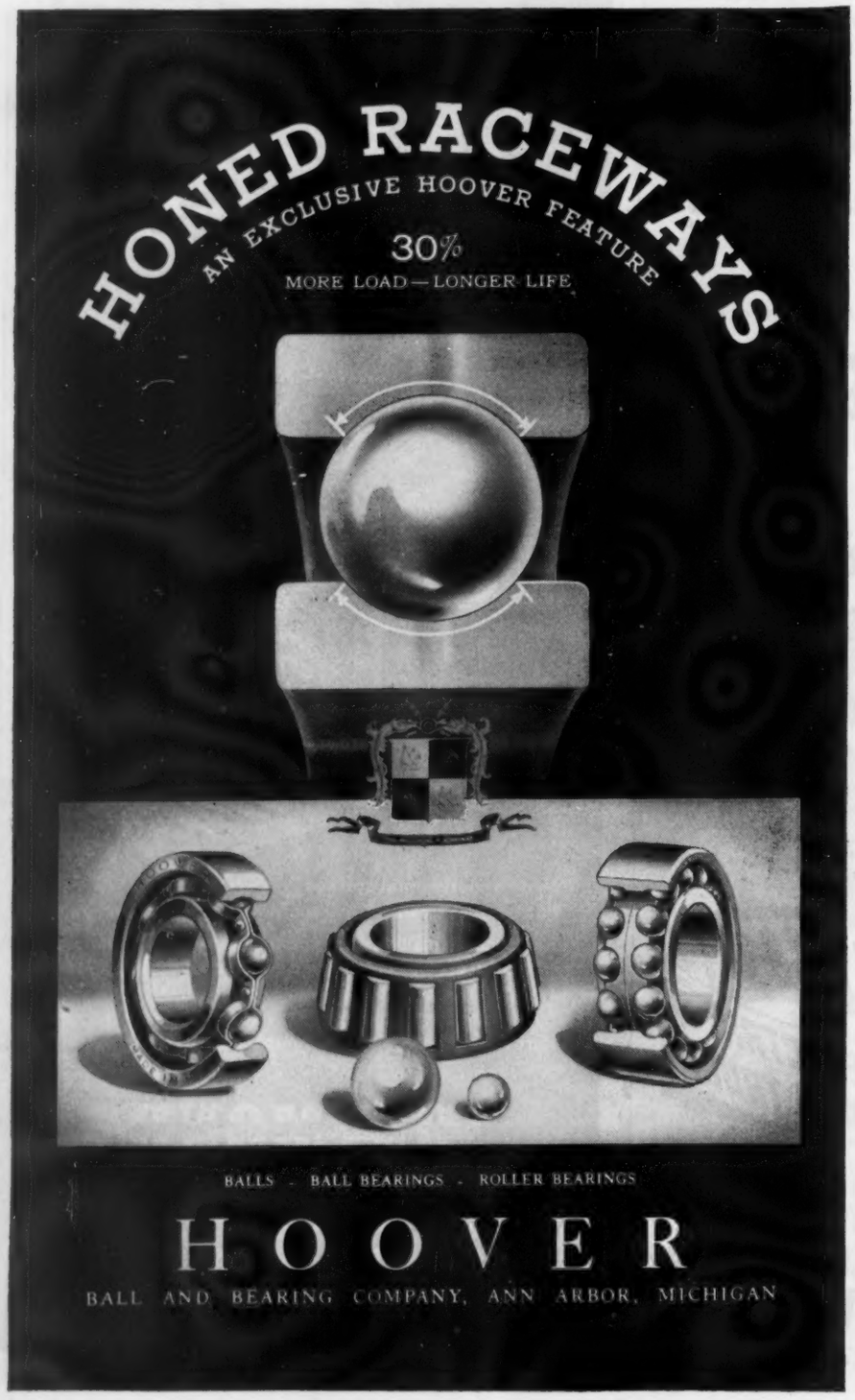
Cincinnati — Books of some pig iron sellers have already been opened for second quarter and it is likely most contracts repeat first quarter. Foundries would like to take in more iron, to meet demand for castings, but labor is not available. Laggard shipments still cause anxiety, and in several cases small foundries faced brief shutdowns.

Chicago — Pig iron supply and demand continue balanced, with little margin to spare. Foundries, somewhat better off currently as to manpower, and producing heavier size of castings, are increasing melts. With foundry scrap not available in sufficient quantity, a heavier demand is placed on pig iron.

Pittsburgh — Pig iron continues tight with heavier demand and a good possibility of interruptions in furnace operation during April, depending on the coal and coke situation.. Stocks of iron at most points are considerably under the 30-day minimum permitted by WPB. This has resulted in heavier pressure on the part of iron consumers for more rapid shipments in order to build up inventory.

Cleveland — Foundry pig iron supply has eased materially, reflecting increased output and breaking up of the traffic jam. Manpower shortage is the chief limiting factor preventing blast furnace relighting. Now that the steel industry has been placed on the National Production Urgency list, some manpower relief is expected. Production of 50,000 cast iron bathtubs has been authorized each quarter for the past five quarters, but second quarter authorization may be decreased.

Republic Steel Corp. has blown in its new DPC furnace at the Corrigan McKinney plant, making 13 out of 14 blast furnaces now pouring iron in this district. The Republic stack was banked for about six weeks, due primarily to coal shortage.



Scrap . . .

Scrap Prices, Page 208

While scrap consumers have not suffered from shortages in most cases, the situation is tight, with inventories low and supply about equal to daily consumption. Lack of yard labor and difficulties of transportation during bad weather limit collection and preparation. Cast grades continue tightest and supply is far from sufficient. While turnings increase in supply and prices are weak in some areas they remain at ceilings in other districts.

New York — While transportation is improving, difficulty continues in moving scrap and consumers of heavy melting steel appear to be pressing as hard for tonnage as ever. They are still not getting enough to sustain meager stock piles, with a result that while there is a little better flow, they are far from satisfied. All yards without exception report insufficient help. In the case of cast scrap, which is also in heavy demand, there is the added difficulty presented by inadequate scrap of this type. Meanwhile prices are holding at ceiling levels, this even applying to turnings.

Boston—Consumers of heavy melting steel scrap are making slight headway in replenishing inventories; incoming tonnage about equals day by day consumption. It now appears one steelworks was recently confronted with open-hearth curtailment due to scrap shortage, but has managed to maintain schedules. Softness in carbon steel turnings has spread to alloy grades with $5, shipping point paid for the latter. Borings are moving slowly and production of light industrial scrap is mounting. Foundry grades are most critical, although selected steel scrap for quality wiremaking is not far behind. Some foundries are operating without inventories, purchasing where possible on a daily basis. On the other hand, some larger consumers have rather substantial reserves for current operations. Shipyards are producing less scrap, and, like railroad material, this is generally allocated.

St. Louis — Rain and snow have reduced scrap supply after an improvement early in the week. Continuing labor shortage limited shipments but mills have been able to build inventories to about five or six weeks supply. Demand for foundry grades is stronger, with many melters in bad situation. WPB is still diverting prime steel grades to steelworks and in turn is seeking to aid foundries by searching for new sources of cast scrap. Prices are at ceilings, except for machine turnings.

Los Angeles — Policy of Kaiser Co. Inc. and Geneva Steel Co. points to use of hot metal and current maintenance of scrap inventories at present levels

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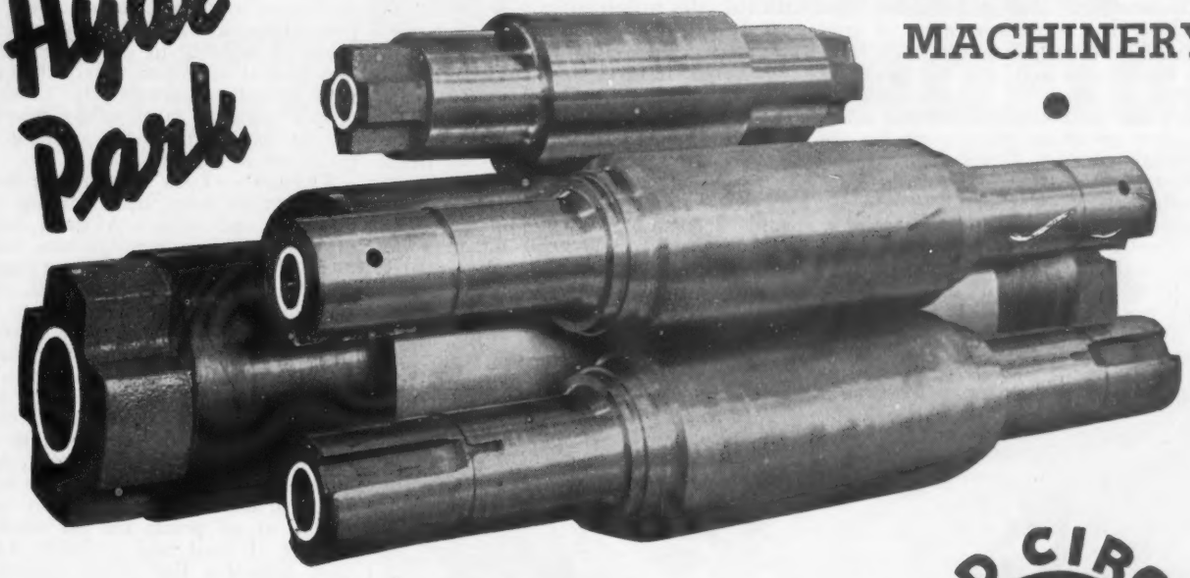

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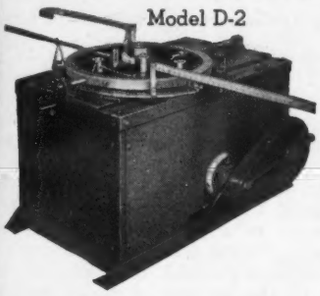

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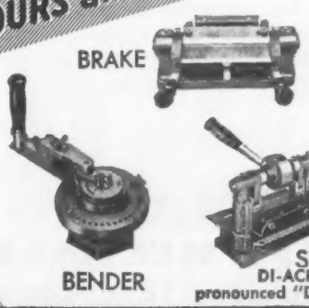

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because of war uncertainties. Sales are at $2 to $3 below ceiling for No. 1 heavy melting steel. Turnings and cast iron borings are plentiful.

Cincinnati — Except for good cast and low phos, current supplies of iron and steel scrap are adequate. Mills have fair inventories and are not exerting pressure for shipment, although accepting steadily on contracts. Buying is absent, but prices on wanted grades are apparently steady. Turnings, however, continue weak.

Buffalo — Sales of about 10,000 tons of heavy melting steel for March delivery are reported. Turnings are in mixed situation, a leading consumer reducing its bid to $13 on machine shop turnings, which is about $1.25 below ceiling, and also dropping the 50-cent commission. One dealer believes sales may be made at about $13.75. Short shoveling turnings are bringing ceiling prices on substantial sales to ferroalloy plants at Niagara Falls, N. Y. A mill consumer has withdrawn substantial tonnages of solid scrap from reserves to balance turnings, which represent about 60 per cent of current receipts.

Detroit — Machine shop and short turnings are confronted by a mixed price situation in that strength is evident in straight-carbon grades while mixed grades tend to be weaker. Middle-ground price remains $9.00-$9.50 for machine shop turnings. Strength in carbon grades is ascribed to shortage of heavy melting open-hearth scrap. A number of automotive lists closed last week, and brought ceiling prices, except for turnings.

Philadelphia — Heavy melting steel consumers continue in urgent need, with production off slightly at one plant because of inability to get scrap and pig iron and at least two others threatened with immediate curtailment. Restriction of cast grades to 60 days has little bearing on district consumers as stocks generally are well under that.

Chicago — Lack of consumer interest continues to keep blast furnace scrap unsettled and weak. A small tonnage of machine shop turnings was sold at $9.50, but all other grades of turnings and borings are purely nominal. Short shoveling turnings are down $1 to $9.50 to $10. Heavy melting grades and electric furnace and foundry material are holding at ceiling prices, although purchases are only at level of current needs.

Pittsburgh — Gossip now current regarding an expected weakness in scrap apparently is manufactured talk. A look at steel mill order books and the realization that capacity operations can be expected at all points for the next nine months at least and probably beyond that, indicates that scrap demand regardless of the situation in Europe will be steady and therefore there should be little fluctuation from the ceiling price. The one exception is in turnings and this is a natural condition, due to excessive volume of turnings as a by-product of the shell program.

Cleveland — Steel mill scrap stocks are lowest since the summer of 1942. Some improvement in shipment of production scrap to consuming points has occurred. Processing of scrap through dealers' yards has also been increased recently.

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Warehouse . . .

Warehouse Prices, Page 206

Cleveland — Steel distributors as of March 1 were permitted to pass on to their customers the interim steel mill price increases granted producers some time ago. The amendment to RPS-6 officially makes interim steel mill price increases applicable to base prices, and amendment to RPS-49 permits the steel distributors to adjust selling prices accordingly. Export base prices, according to amendment No. 12, may also be advanced by the amount of the authorized increases in mill base prices.

Shipments out of warehouse stock continue upward, reflecting further extension in mill deliveries and generally larger military requirements. Steel distributors anticipate a substantial reduction in the mill warehouse load allotment, due to growing shortage of steel supply for certain critical war programs.

Boston — Heavy volume of orders and lagging mill deliveries are further unbalancing warehouse inventories of general line and alloy products. Extended mill schedules are turning more tonnage to distributors for wanted deliveries, rather than prospective price increases. Plates are under less pressure than other flat-rolled steel but demand still is fair. To meet new war requirements some larger orders normally going to mills are placed with jobbers. February daily sales were equal to those of January.

St. Louis — Warehouse demand continues heaviest since the beginning of the war. Extended mill deliveries bring consumers to warehouses in volume, par-

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Inexperienced operator can check dimensions on duplicate work to 1/10,000. Set of anvils to facilitate use with round, flat or formed parts. Special fixtures to enable checking of two or more dimensions at one handling of the work.

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ticularly those whose orders have been deferred by directives. Stocks are low and not readily replenished.

Los Angeles — Alloys, cold-rolled sheets and stainless steels are difficult to obtain from warehouses and corrugated roofing is scarce. Supply is especially inadequate in merchant wire products. Tendency is toward greater use of secondary grades and wasters. A significant factor is rise of resellers who purchase surplus stocks from aircraft and other war plants. These concentrate mainly on aluminum shapes rather than steel but have heavy inventories of too: steels and tubing. This influence has not weakened prices but may become more important.

Seattle — The warehouse situation remains tight, dealers finding it difficult to meet demand. Sheets are exceedingly hard to obtain and in less degree plates and structurals. Representative jobbers look for a poorer year than 1944, due entirely to inability of mills to fill orders. As an example dealers think they may have to content themselves with one turnover of sheets this year as against three or four in normal times. Demand continues strong for all items and inventories are gradually being lowered as replacements fail to keep pace with shipments. There is an opinion that many houses will be forced to meet needs partially from government surpluses.

Cincinnati — February warehouse sales were heavy, considerable demand reappearing because of tightening mill shipments. Steady inroads into stocks have probably reduced them to the lowest point in six months. Individual orders tend larger also, a reflection of pressure for deliveries in the munitions program.

Nonferrous Metals . . .

Nonferrous Prices, Page 209

New York — To meet steadily increasing requirements for war production second quarter allotments to claimant agencies are being whittled down, including transportation equipment and consumer durable goods, the latter by 10 per cent. If manpower limitations can be hurdled, copper deliveries to consumers this month will approach and possibly exceed the former peak. Purchases of foreign copper through government and private procurement now is in excess of a million tons a year. Domestic production and Canadian output have been declining and manpower in mines and refineries is the reason. Average price for imported copper is 12.40 cents per pound with 80 per cent bought at 11.75 cents.

Slab zinc will go under allocation control April 1, metal to be distributed by the Tin, Lead, Zinc Division, based on review of applications. Applications should be filed by March 12 on shipments to be made before April 30. For less than 20 tons a month consumers may accept deliveries from dealers without allocation certificates if the user has not applied to WPB for zinc allocation during the month he accepts dealer delivery. Consumers who can do so are requested to use regular high grade instead of special high grade, the latter being the tightest spot.

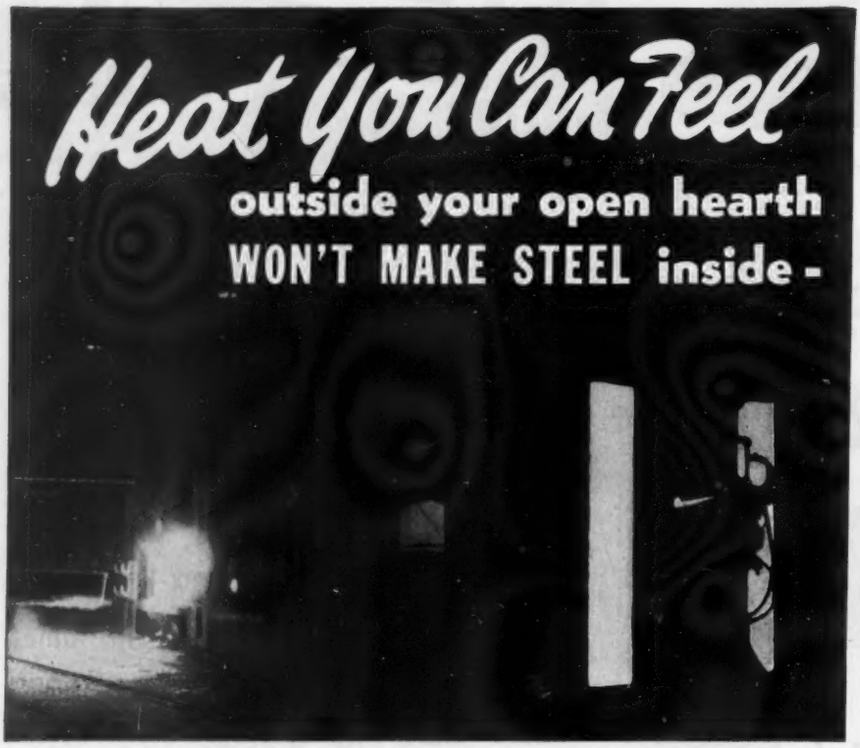
Some war procurement agency programs may be modified to meet second quarter stringency in steel, copper and aluminum. WPB considers it unwise to make any prime copper products available for spot authorization use.

Controlled materials allotments for the second quarter, in pounds, are: Copper sheet and strip, 1.032,850,000; copper rod, bar and wire, 335,368,000; copper tube and pipe, 102,800,000; unalloyed brass mill products, 121,797,000; copper wire mill products, 241,861,000; foundry products, 310.818,000; unclassified copper products, 29,500,000; and aluminum, 810,556,000.

Metallurgical Coke . . .

Coke Prices, Page 205

Pittsburgh — Situation is touchy at many points, with shipping the primary difficulty. Ice and high water in the Pittsburgh area have reduced shipments of coal to coke plants and manpower troubles in the beehive region have cut down beehive coke available. Ovens in operation have moved up slightly, as a result of better weather, and the operating rate is now estimated at 69 per cent of capacity, with some 7600 ovens producing. This is a decline of about 300 ovens over the past three months, although it is an increase over the low point of Feb. 1, when only about 7000 ovens were active. The district's largest by-product coke plant, Clairton works, Carnegie-Illinois Steel Corp., now has approximately a week's supply. It is regarded as a certainty that steel output will begin to drop within two or three days after the beginning of a coal strike.



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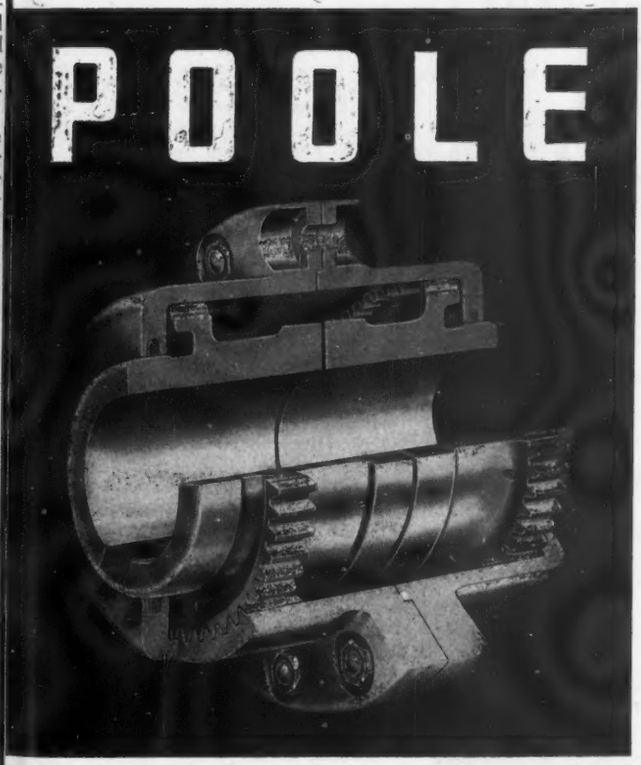

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STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

1400 tons, truck tire plant, Houston, Tex., for Kelly-Springfield Division, Goodyear Tire & Rubber Co., to Mosher Steel Co., Houston, Tex.

804 tons, boiler house extension, Indianapolis Light & Power Co., Indianapolis, to Joseph T. Ryerson & Son Inc., Chicago; bids Feb. 7.

700 tons, mill extension, Chase Brass & Copper Co., Inc., Euclid, O., to American Bridge Co., Pittsburgh; Stone & Webster Engineering Corp., Boston, contractor-engineer.

600 tons, naval experimental buildings in Maryland; to Belmont Iron Works, Eddystone, Md.

550 tons, mill building, Opelika Mills, Opelika, Ala., to Bethlehem Steel Co., Bethlehem, Pa.

234 tons, storage warehouses, Hammond, Ind., for DPC, to Mississippi Valley Structural Steel Co., Decatur, Ill.; Carroll Construction Co., Chicago, contractor; bids Jan. 24.

230 tons, highway bridge, between Fremont and Elk City, Neb., for state; to Bethlehem Steel Co., Bethlehem, Pa.; bids Feb. 8.

165 tons, factory and cafeteria, Wagner Electric Corp., St. Louis, to La Salle Iron Works, St. Louis.

130 tons, repairs and alterations, viaduct, Riverside Drive, New York, through Peerless Construction Co., New York, to Phoenix Bridge Co., Phoenixville, Pa.

125 tons, repairs, Riverside drive viaduct New York, to Phoenix Iron Co., Phoenixville, Pa., Peerless Construction Co., New York, general contractor.

125 tons, building, New York Central railroad, to American Bridge Co., Pittsburgh.

100 tons, recreation building, Syracuse, N. Y., to Utica Steam Boiler Co., Utica, N. Y.

STRUCTURAL STEEL PENDING

26,000 tons, 199 portable hangars, for U. S. Engineers, Columbus, O.

6700 tons, pontoon gears-deck enclosures, Bureau Yards & Docks, U. S. Navy, Chicago; bids Feb. 14.

1600 tons, high octane gasoline plant, Whiting, Ind., for Standard Oil Co. of Indiana; M. W. Kellogg Co., contractor; bids Feb. 22.

700 to 1000 tons, casting shop addition, Chase Brass & Copper Co., Cleveland.

250 tons, plant addition for Heintz Mfg. Co., Philadelphia.

200 tons, addition for Lee Tire & Rubber Co., Conshohocken, Pa.

200 tons, manufacturing plant alterations and additions, Curtiss-Wright Corp., Louisville, Ky.

200 tons, office and manufacturing building, Draper Motors Co., Detroit.

200 tons approximately, power plant, Sarasota, Fla.; bids asked through Ebasco Services Inc., 2 Rector street, New York.

REINFORCING BARS . . .

REINFORCING BARS PLACED

4600 tons, two sections, storm water outlets, New York City municipal Idlewild airport, Queens, 2000 tons to Truscon Steel Co., through M. Dimenna & Sons, Bronx, and 2600 tons to Igoe Bros., through A. Catapano, Glendale, Long Island.

600 tons, Wagner Electric Co., Wellston, Mo., to Missouri Rolling Mill Corp., St. Louis, through Hercules Construction Co., contractor.

225 tons, addition, Monsanto Chemical Co., Monsanto, Ill., to Laclede Steel Co., St. Louis.

125 tons, naval ordnance laboratory, White Oak, Md., to Bethlehem Steel Co., Bethlehem, Pa., through Harwood-Nebel Co., contractor.

120 tons, steel joists, storage warehouses, Hammond, Ind., for DPC, to Laclede Steel Co., St. Louis, through Joseph T. Ryerson & Son Inc., Chicago; Carroll Construction Co., Chicago, contractor; bids Jan. 24.

110 tons, U. S. engineer depot, East St. Louis, Ill., to Laclede Steel Co., St. Louis.

100 tons, hotel building, Portsmouth Hotel Corp., Portsmouth, Va., to Virginia Steel Co., through Muhleman & Kayhoe, contractors.

100 tons, nurses' home, Missoula, Mont., to Cobusco Steel Products Corp., Denver.

REINFORCING BARS PENDING

4000 tons, bridge, Henderson, Ky., for Louisville & Nashville railway (previously reported, bids rejected, now on inquiry by L. & N. railway).

1000 tons, veterans hospital, Tomah, Wis., for U. S. Veterans Administration; bids March 20.

300 tons, factory building, Norwalk Tire Co., Norwalk, Conn., general contractors' bids in.

400 tons, storage bins, soy bean plant, Frankfort, Ind., for Swift & Co., to Inland Steel Co., Chicago; John S. Metcalf Co., Chicago, contractor.

300 tons, repairs to highway bridge over Susquehanna river, Breslau to Plymouth, Pa.; bids Feb. 26.

250 tons, building, International Printing Ink Division, Interchemical Corp., Chicago; general contract to Avery Brundage Co., Chicago; bids Feb. 3.

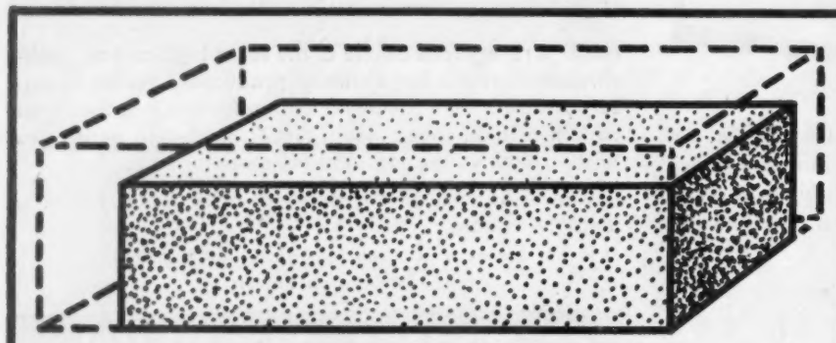
200 tons, plant, Norwalk Tire & Rubber Co., Norwalk, Conn.

200 tons, Navy warehouses, Portsmouth, Va.

170 tons, car repair shops, Brainerd, Minn., for Northern Pacific railroad; Al Johnson Construction Co., Minneapolis, low on general contract; bids Feb. 20.

150 tons, Lake Shore Tire & Rubber Co., Des Moines, Iowa.

150 tons, Indiana Co-operative Grain associa-



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tion, Indianapolis.

140 tons, shore protection, Montrose avenue extension, Chicago, for Chicago Park District, to; Truscon Steel Co., Youngstown, O. Simpson Construction Co., Chicago, contractor; bids Nov. 28.

100 tons, Iowa Ordnance Plant, Burlington, Iowa.

100 tons, expansion, Bauer & Black Division, Kendall Co., Chicago; bids March 12.

100 tons, bridge, Route 13, Lawrence county, Ill., for state highway commission; C. J. Moritz Inc., Effingham, Ill., low on general contract; bids Feb. 24.

100 tons, bridge, Route 5, Pontiac, Ill., for state highway commission; Thomas McQueen Co., Forest Park, Ill., low on general contract; bids Feb. 24.

PLATES . . .

PLATES PLACED

1550 tons, for 25 knock-down fuel oil barges for Army Transport Corp., to Central Steel Construction Corp., Buffalo.

PIPE . . .

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150 tons, 4, 6 and 8-inch, Camp Edwards, Falmouth, Mass.

RAILS, CARS . . .

RAILROAD CARS PLACED

Donora Southern, 50 seventy-ton steel triple hopper cars, to St. Louis plant of American Car & Foundry Co., New York.

Russia, 5000 flat cars with side frames, 3000 to Pullman-Standard Car Mfg. Co., Chicago, and 2000 to American Car & Foundry Co., New York.

LOCOMOTIVES PLACED

Chicago, Rock Island & Pacific, 10 locomotives, to American Locomotive Co., New York, following authorization by federal courts.

Empresas de Minercaao, Brazil, two 2-6-2 type steam locomotives, to Baldwin Locomotive Works, Eddystone, Pa.

CONSTRUCTION AND ENTERPRISE

MICHIGAN

DETROIT—Training Devices Inc., 9841 Grand River avenue, has been incorporated with $100,000 capital to manufacture electric training devices, by Thomas U. Sisson, 5087 Linsdale street.

DETROIT—Modern Corp., 19381 John R street, has been incorporated with $100,000 capital to conduct a metalworking business, by James W. Rathfom, 295 Grove street, Highland Park, Mich.

DETROIT—Reef Industries Inc., 1575 Penobscot building, has been incorporated with $100,000 capital to do general machine work, gear cutting, grinding, tool and jig construction, by Jan Reef, 16141 Lindsay street.

DETROIT—U. S. Rubber Co., 6600 East Jefferson avenue, has let contract to O. W. Burke Co., 1001 Fisher building, for a tire production plant costing about $3 million. Lockwood Greene Engineers Inc., 10 Rockefeller Plaza, New York 20, are engineers.

DETROIT—Multi Metal & Plastic Products Corp., 10226 Woodward avenue, has been incorporated with $20,000 capital to stamp, forge, cast and machine metal products, by Jack Focke, 23024 Madison street, Dearborn, Mich.

DETROIT—General Machine & Fabricating Corp., 1912 Dime building, has been incorporated with $50,000 capital to manufacture fabricated steel products, by George L. Ginger, 16210 Cherrylawn avenue.

DETROIT—Standard Precision Machine Co., 7935 Mack avenue, has been incorporated with 500 shares no par value to manufacture tools, dies, jigs and fixtures, by David H. Kennedy, 15391 Idaho street.

DETROIT—C & S Tool Co., 6718 West Warren avenue, has been incorporated with $50,000 capital to manufacture automatic products, jigs, dies and gages, by Carl Schad, 1318 Richmond avenue, Lincoln Park, Mich.

FLINT, MICH.—Acme Pattern Co., 128 East Third street, has been incorporated with $50,000 capital to manufacture metal and wood patterns, by Harold Dennee, 209 West Taylor street, Flint.

FLINT, MICH.—Manufacturers Equipment & Supply Co., 608 Detroit avenue, has been incorporated with 50,000 shares no par value to manufacture machinery, tools and equipment, by Vernon Bolton, 912 Bean street, Flint.

SAGINAW, MICH.—Saginaw and Midland City Waterworks department, Saginaw, plans postwar construction of waterworks supply from Lake Huron costing about $8 million. Alvord, Burdick & Howson, 20 North Wacker drive, Chicago, are consulting engineers.

STURGIS, MICH.—Sturgis Posture Chair Co., Magnolia street, has been incorporated with $200,000 capital to manufacture metal chairs, posture chairs and office furniture, by Mary Huntley, 901 East Chicago street, Sturgis.

OHIO

AKRON, O.—Akron Standard Mold Co. has received WPB authorization for installation of machinery for production of rubber processing machinery, costing about $48,000.

CINCINNATI—Baldwin Co. has been authorized by WPB to erect a temporary building to house heat treating furnaces and other equipment, including conveyor system, for production of shells, to cost $900,000.

CLEVELAND—Aldridge Machine Tool & Die Co., 10401 Loretta avenue, has been incorporated with $1000 capital and 100 shares no par value to manufacture machine tools and machine parts, by Frank L. Cimperman, 17916 Parkmount road.

PORTSMOUTH, O.—City plans postwar construction of sewage disposal plant costing about $500,000 and sewers costing $282,000. J. F. Parkinson is engineer.

ILLINOIS

CHICAGO—Heick Die Casting Co., 4061 West Schubert street, has let contract to Hope & Jorgensen, 3016 North New England street, for a one-story 60 x 141 x 288-foot plant to cost about $50,000. S. Klefstad, 3600 West Fullerton avenue, is architect.

MOLINE, ILL.—Herman Nelson Corp., 1824 Third avenue, manufacturer of heating, ventilating and air conditioning equipment, has let contract to Piester Construction Co., Davenport Bank building, Davenport, Iowa, for a 220 x 240-foot plant addition on Twenty-fifth street, costing about $200,000. W. L. Parish, 4523 Jersey Ridge road, Davenport, is architect.

RED BUD, ILL.—City is having plans made by Russell & Axon, engineers, 4903 Delmar boulevard, St. Louis 8, for a municipal powerplant building to cost about $40,000.

WEST VIRGINIA

WEIRTON, W. VA.—National Steel Corp. has been given WPB authorization for installation of complete galvanizing line, electrical equipment, etc. for galvanizing steel sheets, to cost about $140,000.

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800 OUTSIDE ROOMS ALL WITH PRIVATE BATH . . . SINGLE FROM $2.50 . . . DOUBLE FROM $4.00

Charles H. Lott, General Manager

MISSOURI

HOUSTON, MO.—City is having preliminary plans made for postwar sewage treatment plant costing about $115,000. Russell & Axon, 4903 Delmar boulevard, St. Louis 8, are consulting engineers.

RICHLAND, MO.—City, care city clerk, City Hall, plans postwar sewage treatment plant costing about $110,000. Russell & Axon, 4903 Delmar boulevard, St. Louis 8, are consulting engineers.

SHELBINA, MO.—City plans postwar sewage treatment plant costing about $70,000. Burns & McDonnell Engineering Co., 107 West Linwood boulevard, Kansas City, Mo., are consulting engineers.

OKLAHOMA

SHAWNEE, OKLA.—City has plans completed for postwar sewage disposal plant costing about $200,000. W. R. Holway, 302 East Eighteenth street, Tulsa, Okla., is consulting engineer. T. E. Thompson, City Hall, is city engineer.

WISCONSIN

EAU CLAIRE, WIS.—City has plant under way for postwar garbage incinerator, costing about $90,000. A. R. Garnick, City Hall, is city engineer.

EAU CLAIRE, WIS.—City, City Hall, plans postwar construction of waterworks improvements, including high-pressure pumping station and supply line, to cost about $440,000. Greely & Hansen, 6 North Michigan avenue, Chicago, are consulting engineers. A. R. Garnock, City Hall, is city engineer.

DELAVAN, WIS.—City has plans under way for postwar sewage treatment plant to cost about $70,000. F. Jensen, Elkhorn, Wis., is consulting engineer. J. Diagan, Burlington, Wis., is engineer.

KANSAS

COFFEYVILLE, KANS.—City, City Hall, has plans under way for postwar modernizing of its water treatment plant, new pumping plant, etc., to cost about $740,000. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers. J. G. Duckworth, Coffeyville, is city engineer.

TOPEKA, KANS.—Kansas Power & Light Co., 808 Kansas street, plans a 26-mile pipeline and a gasoline recovery and dehydration plant to cost about $800,000.

NORTH DAKOTA

MANDAN, N. DAK.—City plans postwar sewage treatment plant costing about $221,000, refuse incinerator, $37,000 and storm sewers $222,000. Burns & McDonnell, 107 West Linwood boulevard, Kansas City, Mo., are consulting engineers.

IOWA

OTTUMWA, IOWA—Ottumwa Foundry Co. has had plans prepared by D. D. Morgan, Farmer and Merchant Bank building, Burlington, Iowa, for a foundry building 40 x 238 feet, costing about $50,000. Beling Engineering Co., 501 Fifteenth street, Moline, Ill., is consulting engineer.

CALIFORNIA

GLENDALE, CALIF.—Valley Screw Products Co. has been formed by Roy S. McFarland and has established operations at 1804 Victory boulevard.

INGLEWOOD, CALIF.—Irwin Engineering & Mfg. Co. has been formed by Harry Irwin and Martin J. Dabrowski and is operating at 5349 West 119th place and 2509 Manchester avenue.

LOS ANGELES—Mission Welding Service, 8221 Atlantic avenue, Bell, will add 4800 square feet for electric and acetylene welding.

LOS ANGELES—Hollister Coil Spring Mfg.

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Co., 7100 Avalon boulevard, will build a machine shop 50 x 100 feet, to cost about $25,000.

LOS ANGELES—Star Tool & Cutter Grinding Co. has been formed by Henry S. Siemsen and Emerson L. Janssen and has established operations at 2302 Pontius avenue.

LOS ANGELES—Industrial Furnaces Inc. has been incorporated with $50,000 capital by James H. Mitchell and associates. Mitchell & Johnson, 333 Roosevelt building, are representatives.

LOS ANGELES—Standard Nut Mfg. Co. has been incorporated with $25,000 capital by Alfred H. Brophy and associates. Edward Flam, Fidelity building, 548 South Spring street, is representative.

LOS ANGELES—Harold E. Peterson, 1350 Elwood street, will build a plant addition covering 7150 square feet for manufacture of air conditioning equipment, kitchen equipment and vegetable dehydrating machinery.

LOS ANGELES—Atlas Scraper & Engineering Co., 6203 Maywood avenue, Bell, will build a 6400-square foot addition for manufacture of road scrapers and rippers and structural fabrication.

LOS ANGELES—New metalworking industries recently established in this area include: Redson Gage Co., 3708 San Fernando road, Glendale, lapped precision gages for ordnance and aircraft; Demaret Fabricators, 1432 East Sixty-second street, steel rules, dies and die cutting; D. & L. Engineering Co., 7416 Melrose avenue, dies, tools, jigs and fixtures; H. & H. Machine Products, 7513 South Western avenue, screws, aircraft parts.

OAKLAND, CALIF.—Pacific Tire & Rubber Co. has authorization to spend $1 million for plant addition and equipment to add capacity for 216,000 truck tires annually.

PASADENA, CALIF. — Crown City Plating Works, 165, South Fair Oaks avenue, will add 6500 square feet for electroplating and anodizing.

PASADENA, Calif.—Aerojet Engineering Co., 285 West Colorado avenue, will add to its plant at Azusa, Calif., through DPC aid, for jet propulsion units, at cost of $200,000.

TORRANCE, CALIF. — Ames Oil Equipment Co., 20700 South Figueroa street, will build 3500-square foot shop on 13-acre tract recently bought, for manufacture of oil refinery components.

OREGON

PORTLAND, OREG.—WPB has approved installation of equipment to manufacture vegetable adhesives by Swift & Co., at its North Portland plant at cost of $16,737.

WASHINGTON

SEATTLE—Seattle Brass Co., 4047 Seventh avenue, zone 8, has let contract to the Austin Co., 16112 Euclid avenue, Cleveland, for a one-story 60 x 120-foot foundry building to cost about $50,000.

CANADA

GALT, ONT.—Canadian General Electric Co. Ltd., 212 King street West, Toronto, is considering plans for plant here estimated to cost with equipment about $75,000.

LONDON, ONT—Spartan Co. of Canada, radio and radio equipment, Elm street, plans plant addition estimated to cost about $50,000 with equipment.

WINDSOR, ONT.—Ford Motor Co. of Canada, plans to start work without delay on plant addition, to cost about $50,000.

MONTREAL, QUE.—Liberty Watch Case Co. Ltd., 940 Inspector street, has given general contract to Louis Denolo Inc., 85 Jean Talon street west, for plant to cost about $25,000.

MONTREAL, QUE.—Howard air Conditioning Ltd., 2100 Girouard avenue, is having plans prepared for plant addition estimated to cost $35,000 with equipment.

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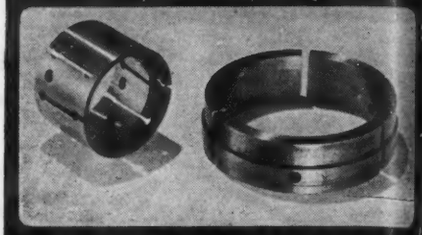

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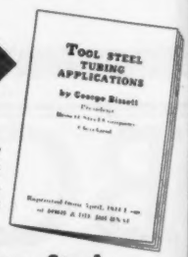

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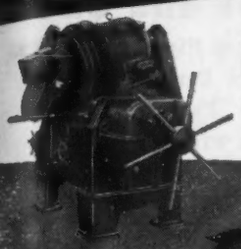

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Mr. Fox directs activities in business administration, public relations, personnel, reports, research and special studies. He has a B.S. degree from Western Michigan College and an M.A. degree from the University of Michigan. He was formerly a member of the public schools administrative staff of Kalamazoo, Michigan, and was on the faculty of Kalamazoo College and of the University of Michigan.

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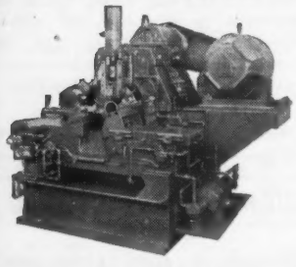

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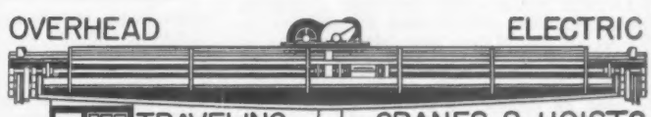

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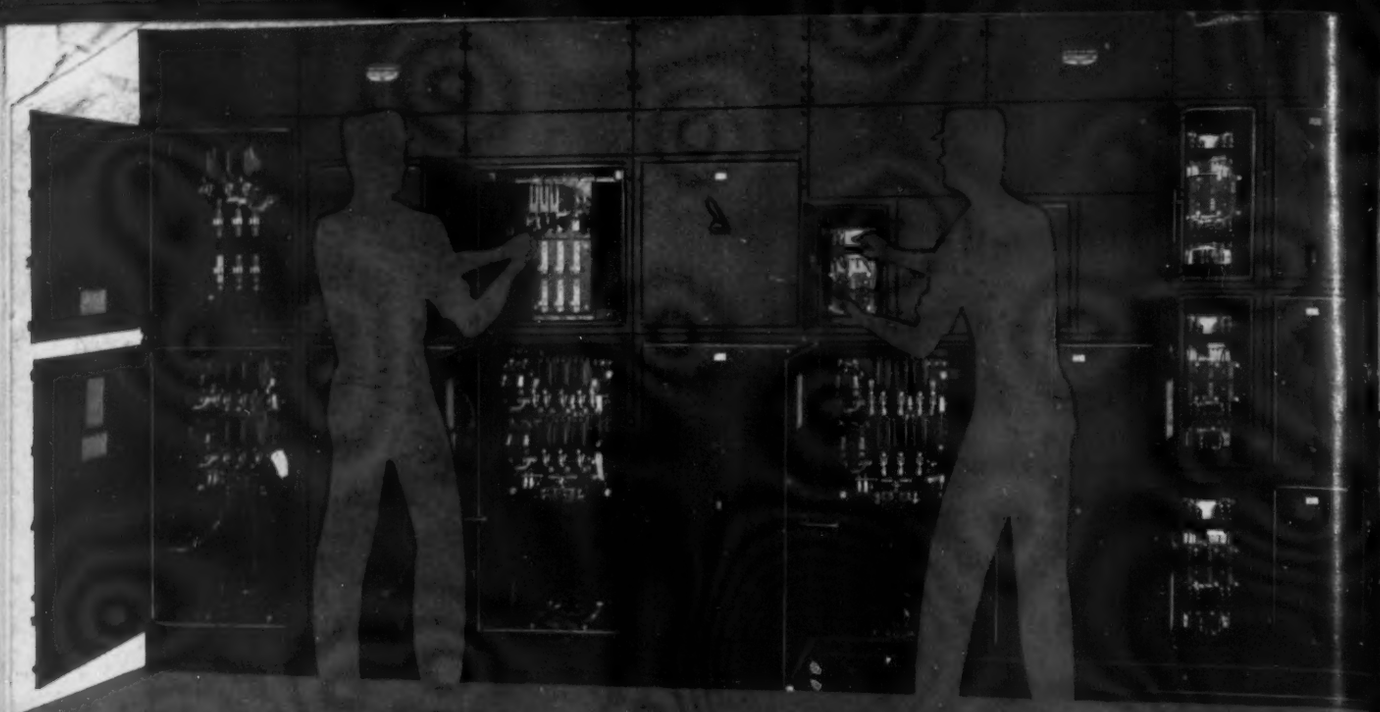

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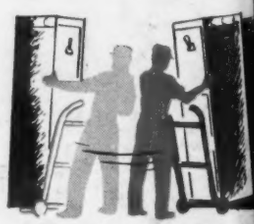

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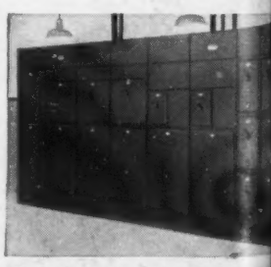

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